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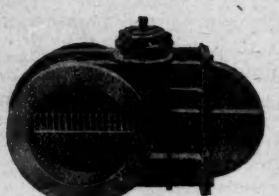
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EDITORIAL NOTES.

Sheffield Coke Conference—and After.

BUSINESS enterprise does not consist alone in doing those things which produce immediate monetary profits, but in doing also those things which progressively stabilize a business, and assure its future. We should like those words to be borne in mind in connection with the strong movement which has been inaugurated to ascertain what can be achieved to bring about an improvement in the manufacture of gas coke by high-temperature carbonization, especially for domestic heating, and to make real efforts in the matter. The time is unusually opportune for this, in view of the coke position, and the plea for a purer atmosphere. People are asking for a better solid smokeless fuel; and the question for the men of the gas industry is, "Can you give it to them?" There is urgency in the matter because of the opportuneness. A singular thing, however, is that it is not the technical men of the gas industry who are taking a lead in this question, but the men of the chemical industry and the chemical engineers; and our friends of the coke-oven industry are keeping a close watch on what is being said and done, because they recognize that, in the market that the displacement of raw coal offers, there is room for both themselves and the gas industry to meet the demands. In view of these considerations, we should like to see some definite action taken by the Institution of Gas Engineers, who were represented at the Sheffield Conference. We have had the Coke Competition. The leading papers have been published; and in due course extracts will see the light of day from the other papers to which awards were made. There have been the Leeds and the Sheffield Conferences; and illuminating discussions have taken place at them. But what now? Is the industry going on in the same old ways—just producing coke, and devoting a lot of energy to finding customers? Or is it going to attempt to produce suitable qualities of solid smokeless fuel by the means which are available, and, by its virtues, create such a liking for it that people will buy it, so causing a diminution in the present expenditure of energy on the part of the producers of gas coke in finding a market for it?

The Sheffield Conference was extremely valuable for the expressions of opinion and information it produced from competent men, and for the publicity that has resulted. But in one respect the proceedings have an unfinished appearance. Nothing was done definitely to promote effects beyond the impressions made upon the minds of the 350 men (a few ladies were also present) who were there. What we should have liked to see would have been a recommendation from the Conference that the further discussion of the matters before it should be taken up by the technical organizations of the coal-carbonizing industries, by each convening a special meeting for the purpose. The interest created must be kept alive—the subject requires to be talked about and investigated; and a policy for the improvement of coke quality needs adoption, at any rate in the gas industry. The brains of the industry will not find the production of means for accomplishing this beyond their compass; men are already at work in that direction. If necessary, there must be a reorganization and readjustment of our methods preceding the deposit of coal in the retort-house hoppers. Those methods are, if need demands, as subject to change as anything else. The industry has had to vary its procedure in carbonization to attain to a higher efficiency. In sulphate of ammonia production, chemical and physical characteristics have been altered to meet the requirements of consumers. It has had to dehydrate tar to make it suitable for road purposes. It is now standing before a big coke problem, and growing competition, without any pronounced policy for the betterment of its position. There is a matter here in which the President of the Institution (Mr. C. F. Botley) might move in conjunction with his Council; if necessary, convening a special meeting of the members of the Institution for a full discussion of the technical aspects of the problem. In other words, it is imperative that the gas industry should determine precisely its situation and the possibilities in relation to the provision of a universally suitable solid smokeless fuel. At the moment (generally speaking) the gas industry does not know where it stands, or at all events there is little evidence that it does. In this connection, another suggestion may be made; and it is that if there is any dearth of subject-matter for meetings of District Associations, the chief Coke Competition prize papers might be utilized as the bases for three discussions—one on the papers in each section.

Turning to the discussion at Sheffield, the most prominent feature in it was the subject of the blending of coking and non-coking coals for the production in high-temperature work of a free burning coke. Not a single speaker hinted that this was wrong. On the contrary, the evidence produced was to the effect that, given coals of a fairly moderate ash content, blending supplies the means of accomplishing a considerable physical change in coke, and of promoting conditions in the retorts which would facilitate the penetration of heat, quicker carbonization, and a greater throughput in a given unit of time, which, in turn, would enable the yield of gas per retort per day to compensate for the use of the lower gas-yielding non-coking coals. Through this, there is held out to us, on the one hand, the capacity for purchasing a larger range of coals for use in gas making; and, on the other hand, where highly bituminous coals are used, the utilization of the plastic substance (which hinders heat penetration at the present time) as a binder for the non-coking coals—as Prof. Wheeler puts it, what the non-coking coal lacks, the bituminous coal will give. This aspect of the matter supplies a new value to the plastic layer which has hitherto caused waste of time in heat penetration, and therefore in the employment of retorts to the fullest extent as well as a sacrifice of temperature. Through the combination of the coking and non-coking coals, we also get, as Evans, Lander, and many other workers—including some of the contributors to the Coke Competition—have shown, new physical characteristics in the coke, which make it easily combustible. The Conference furnished excellent evidence in these respects, and regarding the necessary procedure in blending (particularly in regard to correct proportioning) from the coke-oven industry, and from those who have been experimentally working upon the subject. The effect of blending upon throughput was particularly emphasized by those with experience in the coke industry. In short, every speaker in the discussion made useful contribution; and we hope the report which we published last week (where it has not already received full consideration) will be critically studied in conjunction with the Coke Com-

petition papers. We believe with Prof. Cobb that, in respect of coke, a new vitality has been produced by what has been done; and our hope is that it will not be allowed to die down, but that lasting good will result.

Public Service On and Under the Roads.

IN the proceedings at the Public Works, Roads, and Transport Congress last week, there were several matters which have perennial interest for both road authorities and public utility undertakings; most of the contributions being directed to the beneficial purpose of making the best possible use of our roadways. A point, however, that strikes us about such discussions at general conferences of this character is that, though much that is said may impress and have good result in individual cases, they lead to nothing of a definite character which can be universally applied. The end of each discussion on this occasion left everything open, with prior convictions remaining because every individual thinks that his opinion is still the right one. It would be a good thing if, these matters having been subject to open discussion, there was now a round-table conference by a small committee constituted of representatives of the organizations of the authorities and the industries concerned, with a view to ascertain whether or not some joint report and recommendations could be arrived at. We are in the position to-day at which modern traffic has altogether altered the structural requirements of roadways; at the same time modern developments have rendered more imposing and important the duties of public service utilities to the community. It would therefore be an excellent change if road authorities and statutorily authorized undertakings would now regard themselves as having common interests in doing the best possible for the public, and would effect, as far as possible, a co-ordination of their interests, instead of (as has been increasingly evident of late) the road authorities trying to ride more or less roughshod over the public utility concerns. That policy can have but one end, defence, and provoke (when opportunity arises) counter-attack. A broader outlook is required—an outlook which has in it a recognition that every public service, whether it be given by the road surface or under the surface, is part of an indispensable system.

The strained relationships which exist to-day were plainly in evidence at the conference; and so far as the underground users of roads are concerned, there was ample demonstration that—statutory rights and service to the whole community notwithstanding—the highway authorities regard the public service of accommodation for traffic as being so supreme that it should dominate all else. With all respect we say that that is an attitude which cannot be allowed to obtain, and there is no reason why it should, as Mr. G. P. Warner Terry so well showed in his paper on "Public Utility Services in Highways." As he pointed out, the highway authorities are not the owners of the roads; the various users of the subsoil are there for service necessary to the public, and authorized by Parliament in the interests of the public; while the highways themselves constitute only one branch of public service. On the other hand, Mr. Roland Fletcher appears to think only in terms of damage to road surfaces, and not in those of the damage he would inflict upon the other public services. The right of the road authorities to lordship over the other public services is as superficial as are the road surfaces themselves, while the subsoil beneath the roads is as important to public service as—in the aggregate far more so than—the road surface. Yet Mr. Fletcher in his paper says he would like to see legislation which would strengthen the highway authorities' position to such an extent as to enable them actually to forbid the breaking up of new surfaces for a definite period after their laying. Mr. Fletcher's ambition suggests the view that all other public services are conducted by unreasonable men, who attack the road surfaces not for some practical or needful purpose, but apparently out of pure mischief; and so he would give the road authorities autocratic powers against all other public services. Furthermore, he desires that all reinstatement work should be done by the highway authorities, and the full cost charged-up to the various persons or undertakings (some of which, by the way, are heavy ratepayers) responsible for breaking-up the road. There is room for contention there, depending largely upon the meaning given to "reinstatement," the condition of the roadway immediately preceding the opening, and the character of the damages made upon the undertakings concerned. We will not dwell upon the matter in this comment, as questions affecting the use by statutory undertakings of the subsoil of roads are at the moment being dealt with by the recognized organizations of public utility undertakings, who will no doubt take due notice of Mr. Fletcher's various recommendations, with some of which there will be agreement, while with others there will be contention—especially where it is proposed that existing rights and privileges shall be made subservient to new powers for the highway authorities.

The same inconclusive position is found as a result of the discussion on the joint paper by Messrs. Thomas Glover and Arthur E. Collins on "The Use of Tar in the Construction of Roadways." The paper was in the main directed to the proper methods of applying tar to road construction or to surfaces; but it was quite natural that in the proceedings the controversy as to tar and bitumen should receive some prominence. On this point the net result of the discussion was to leave things much as they were. But there was one remark by one of the speakers—Mr. Elford—which is suggestive. He urged those interested in the coal tar industry "to put their energies into the laboratory, and produce materials which possess the good characteristics of bituminous materials. He is quite sure that, given the right material to take the place of bitumen, there is not a road engineer in the country who would not prefer to use British material rather than anything which comes from abroad." If that be so, then there again we have a suggestion for getting together round a table—gas engineers and road engineers—to ascertain precisely what it is in this regard the road engineers want. Apparently it is something which is outside the Road Board specification; but a definite understanding will never be reached by open meeting and general discussion. Half-a-dozen appointed heads on either side should, in private conference, be able to clear the position, and produce something positive. If there is anything wrong with tar for all the purposes of the road engineer, then let them say what it is and definitely what they require; and let this be done in consultation, and not at a distance. Otherwise matters will drift, and no one will be satisfied. In this regard there are one or two remarks made by Sir Henry Maybury which invite attention. He says that but for the suicidal tar policy of gas undertakings after the war, probably the use of bitumen would not have made the strides it has done. The "suicidal policy" appears to have been in respect of prices, because Sir Henry says "prices in those days were pretty high." Thus, it seems, bitumen is a weapon of retaliation, rather than the possessor of superior qualities or cost economies at current prices. But let us remind Sir Henry that the price of coal in those days was also high; and as an old gas engineer, he knows that at such times it is imperative to obtain the best prices that secondary products will fetch. What matters now, however, is the price of tar to-day—not then. Another point which needs correction is that, according to the report of his utterances, Sir Henry stated that he remembers having "an important deputation from the tar interests, asking him to issue a circular-letter to the local authorities of the country, telling them that they should not use tar upon the highways, but should get anything else, because they wanted all the tar that they made for the purpose of briquetting material." We suggest to Sir Henry that it was not the "tar interests" who formed that deputation, but the South Wales briquette manufacturers, and that the tar interests were strongly antagonistic to the Road Board advising local authorities as suggested.

A session of the Congress was organized by the Institution of Gas Engineers; and the President (Mr. C. F. Botley) presided. Two papers were read and discussed. One was by Mr. C. S. Shapley, and dealt with public lighting by gas, with special reference to automatic lighting and extinguishing systems. Mr. Shapley is well qualified to deal with this subject, as, in addition to being Engineer and General Manager of the Leeds Corporation

Gas Department, he is responsible for the whole of the public gas and electric lighting of the city; and right well he holds an even balance between the two agents. On this occasion, he treated of a subject which has large importance for those concerned with the making and the use of roadways. Good lighting of the roads and footpaths is as essential—more so in fact from the point of view of safety—as good road surfaces; and that good lighting requires to be done economically. An important means to efficiency and economy is simultaneous lighting and extinguishing; and as Mr. Shapley has had large experience of three forms of controllers, he was able to speak of them at first hand. Of them all, he was able to say they are efficient and thoroughly reliable. The paper and the excellent discussion which followed should be effective in stimulating interest in mechanisms and systems which are such valuable aids to the promotion of higher standards in public lighting.

The other paper was by Mr. George Evetts; and this was on the subject of the valuation of gas undertakings for rating purposes. It gave as concise a view of this intricate question as the wit of any man could accomplish, though in it there may be controversial points in matters of detail over which experts are pleased to argue. The numerous considerations involved in valuing a gas undertaking are not likely to be materially altered when the new Rating and Valuation Bill becomes law, except that the vital matter of tenant's interests may be affected, although a necessary factor so long as the principle of landlord and tenant is followed. There is a warning by Mr. Evetts which should be noted, notwithstanding the fact that the Government have withdrawn the clauses relating to "special properties." This withdrawal is only a temporary expedient with the view of expediting the passage of the measure through Parliament. A separate Bill is to be promoted next Spring to deal with special properties on similar lines. This being the case, the point in question holds good. It is that under the Bill gas undertakings can be valued by the Assessment Committee or by the Railway Assessment Authority. If by the latter, appeal can be made to the Railway and Canal Commission. There will be no appeal to Quarter Sessions against a decision by an Assessment Committee; but appeal must be made to the Railway Assessment Authority, and from that tribunal to the Railway and Canal Commission as before. To this extent the valuation of special properties will be diverted to one body. Section 43 of the Bill prescribed that special properties valued by the Railway Assessment Committee are to be valued according to the provisions of the special properties section (clauses 36 to 41), "except the provisions relating to the ascertainment and apportionment of the values of railway undertakings." At the end of sub-clause (4) of section 39, these words occur: "The authority and any such court [of "appeal] shall not have regard solely or primarily to the "return to which a tenant is entitled." Fears have been expressed that the Railway Assessment Authority may adopt the "railway principle" when dealing with gas-works, and regard the tenant's return as of no importance. Beyond this, there appears to be little in the Government plans which need disturb the gas industry, in view of the vote last week which has exempted machinery from rating. But such matters as are important to the industry have been investigated by the legal advisers of the National Gas Council. To the discussion on Mr. Evetts' paper, it will be seen that Mr. Arthur Valon made a worthy contribution.

Modern Gas Practice in America.

THE bird's-eye view of American gas practices to-day which Mr. G. M. Gill gave the members of the Southern Association at their recent jubilee meeting (see "JOURNAL," p. 512) was fascinating in three respects. It told us much in concentrated form; it imparted information which has a bearing on our own particular current problems; and, as the President (Mr. P. G. G. Moon) pointed out, it bid us get outside our own insularity, and see what others are doing. Mr. Gill has been twice to America on missions of investigation, with eyes, ears, and notebook wide open, and as there are no barriers between professional gas men of different countries, he found, on both journeys, his American confrères as willing to give as he was to receive. As a matter of fact, the substance of his gleanings in the United States and Canada, as presented in the paper, indicates that the gas men of America are proud of their performances, which show an excellent vitality and power of creation as changes in circumstances demand. At one time, when carburetted water gas held sway, it looked much as though the science and art of manufacturing coal gas for town supply in the United States was dying out; but that was only a temporary phenomenon which this century has obliterated, and the last decade has caused to recede to a far place in memory, although carburetted water gas still exceeds 50 p.ct. of the total gas—coke-oven gas, coal gas, natural gas, and oil gas combined—distributed in the United States. But equipment of works for coal-gas production on lines to suit present and prospective conditions is making great headway, partly because there are omens of the oil supplies dwindling, and partly because the natural gas supplies are taking the same course, and no power on earth can prevent them doing so. One cannot extravagantly tap and still possess. Moreover, the capital charges involved by natural gas supplies are frequently some 50 p.ct. in excess of those involved by manufactured gas. There are good reasons, then, why manufactured coal gas should again come into its own, and on an unprecedented scale and from unprecedented sources—that is to say, compared with the carburetted water gas era, during which coal-gas manufacture had a more or less limited representation. In connection with the factors which called for this (shall we say?) remaissance of coal-gas manufacture, we get figures presented by Mr. Gill which prove that those vague hints of electricity sweeping the light, heat, and power fields in the United States are merely fairy tales. The consumption of gas in 1923, being 418,000 million c.ft., evidences a business larger than our own by 73 p.ct.; and per head of the population, there was an increase in the ten years to 1923 from 7335 c.ft. to 9550 c.ft., or 30·2 p.ct.

Another interesting fact is that the source of gas supply which comes next to carburetted water gas in volumetric superiority is coke-oven plant, from which the gas is purchased for town distribution; coal gas plant comes next; then natural gas and oil gas. Data showing the actual order of contribution to the supply are given in the paper. But the point to be noted is that, for the reasons already stated, the developments in plant for the manufacture of coal gas are going on apace, and, with labour charges a good incentive, largely in two directions—small horizontal ovens and continuous vertical retorts; the latter being mostly of British types. But where our American friends have diverged largely from British carbonizing practice is in the adoption of the small horizontal ovens—in one example referred to by Mr. Gill, they are each capable of carbonizing 2 tons of coal in twelve hours. From his examination of the ovens, he is inclined to the view that they would be particularly suitable for carbonizing coal which does not coke well enough for ordinary gas-works purposes, but which in bulk could be employed successfully. The coke shows a tendency to be harder than ordinary horizontal retort coke.

From a study of the paper, it appears that in America there has of late years been more advanced co-operation between the fuel industries than in this country; and this affects one of the main problems with which the gas industry at home has to deal to-day. In the gas industry of the States, there is the production of a harder form of coke, by carbonization in ovens, as well as the lighter grade by continuous vertical retorts. The business of the gas industry is to meet the requirements of customers, and not to expect customers willingly to accept something which they do not regard as suitable for their purposes. Again, we have already noted from the paper the growth of the utilization for town supply of gas from coke-ovens; and in this connection there are these striking passages in the paper: "The Americans have had the "good sense to realize that, to work coke-oven plant to "the best advantage, it is essential to have a good market "close at hand for the coke, gas, and other bye-products, "and have appreciated that it is better to transport the

"raw material than the products derived from it. As a "consequence, the coke-ovens and steel works have been "built outside large towns, which find a market for the "surplus gas, coke, and other bye-products not required "in the steel works." We had in this country in 1924 a World Power Conference at which there was a flood of talk as to the conservation of coal and the co-ordination of the use of fuel; but little movement of a practical nature has so far resulted from it. America, it is evident, has been working, as well as talking. The ideal of the progressive gas engineer in our country is to make the gas-works the centre of fuel supply for his statutorily allotted territory, as well as to co-operate with cognate industries in the mutual realization of maximum economies. But the materialization of ideals requires action. Mr. Gill gives information as to the care taken in America in the cleansing, preparation, and blending of coals for the making in ovens of coke suitable to purpose. The method of mixing coals is by belts running at different speeds; and by this means there can be any proportioning to produce coke of the characteristics desired. The subject of blending is now occupying the attention of gas engineers in this country, with the view of providing coke which will be suitable not only for water-boilers, central heating, and enclosed stoves, but for that, in the aggregate, huge consumer the domestic grate—blending in high-temperature work being for that purpose the only visible alternative to low-temperature coke. We know that not only is the subject of coal blending for the purpose of making a better structured coke receiving consideration by gas engineers, but in areas where metallurgical coke is required some gas men are considering afresh the question of part of their carbonizing plant being of the oven type. To such engineers Mr. Gill advises a trip to America to study what is being done there.

It is patent from the paper that we have much in connection with both policy and plant that we can learn from our friends across the Atlantic, just as they admit that there is much they can learn from us. We hear a good deal about conditions being different in the two countries. They may be; but we see little in connection with the divergencies in conditions which affects what should be the common policy of adopting those courses which will comply with needs, and which by co-operation will promote inter-industrial economies and service. It is clear from the paper that in these respects America has got farther along the road than we have; on the other hand, we have pushed farther along the road of liberty in respect of the production of gas by charging for potenial heat instead of gas volume.

There is much else that is suggestive in Mr. Gill's paper —such as information as to round and deep purifiers, the advance in America of tankless holders, the improvements in water-gas plant, developments in distribution, the employment of trenching machines for main work, and the scheme of making each consumer pay his proper proportion of standing charges for gas supply, and (say) $0·5 per 1000 c.ft. for any consumption. By such means, the small and large consumer alike justly pay their full charges, and the lower price per 1000 c.ft. encourages the use of gas for all purposes. This part of the paper is worth study equal to that which will be given to the technical parts.

Protection for British Gas Mantles.

THE British gas mantle makers will derive gratification from the report of the Committee who have been making inquiry, in accordance with the terms of the Memorandum relating to the Safeguarding of Industries, into their claim for the imposition of a duty upon imported mantles. The Committee, it is evident, went with scrupulous thoroughness into the matter; and the case and statistics presented by the applicants adequately justified the recommendation of a duty, which, it is hoped, will have the effect of increasing employment in the trade, and help the makers, by enlarging the demand for their productions, so diminishing their on-costs and general overhead and administration expenses that the buyer of their products will in due season share in the advantage. The suggestion of the Committee is that a flat rate duty not exceeding 6s. per gross (equivalent to ½d. per mantle) would enable the industry, reorganized and concentrated as it might be, to maintain itself in a healthy state. The applicants made no claim that the industry should be regarded as important from the employment point of view; but the Committee do find that the industry should be regarded as of substantial importance by reason of the nature of the article produced. We have only to go back to the early days of the war to obtain proof of the importance of making the country wholly self-reliant in respect of gas mantles, having in view the dependence of millions of people in the country upon gas and incandescent mantles for their artificial light. But that, while recognized, does not appear to be the main reason which influenced the Committee's decision on this point; they apparently place greater weight upon the fact that the gas mantle industry is the only serious commercial outlet for the compounds of thorium and cerium, and it is important that the thorium nitrate industry should not be again lost.

Another question into which the Committee entered is, Are the goods being imported in abnormal quantities? The answer depends very much upon the angle from which this point is examined. If factories and plant are not being worked to their maximum capacity and efficiency, owing to competition of mantles from abroad, then we should say not that the mantles were being imported in "abnormal" quantities, but that they were to a degree which inflicts harm upon the economic position of the home producers, and therefore upon the users of the British-made goods. Interesting data are given in this connection. The total sales of mantles for British consumption in 1924 amounted to 432,096 gross, or 62,221,824. Of these, 61·9 p.ct. (or 267,424 gross) were home produced, and 38·1 p.ct. (or 164,672 gross) were imported. Since 1920, the annual figures have, through various causes, varied appreciably; but no significance can be placed upon the differences in view of the factors which are shown in the report to have influenced purchases and imports. For example, in the first six months of this year, 113,211 gross came into the country from abroad, as against 62,866 gross for the corresponding period of 1924. When it is seen that in 1920 the total sales for British consumption amounted to 470,287 gross, of which the British makers produced 83·4 p.ct., and imports were only 16·6 p.ct., and the figures are compared with those for last year (respectively 61·9 and 38·1 p.ct.), there is full justification for the Committee's remark that the average importations during the years 1921-4 were at a rate which did in fact cause the machinery of the British factories to be largely unemployed—factories and machinery which were developed to meet the requirements of the gas-consuming public when they stood in the greatest need of British gas mantles. Memories and gratitude are sometimes short-lived. It is also found by the Committee that there is a substantial margin between the price at which foreign mantles are sold to the wholesalers in this country, and the figures at which similar goods can be profitably manufactured here and sold to the wholesalers. Costs and the restricted scope of production through foreign competition would account largely for the difference. Further reflection of the degradation of conditions for the British makers is found in the fact that in 1920 the number of persons they employed was 3238, as compared with 1707 in 1924.

All these things go to prove the justness of the Committee's finding that the British mantle industry is certainly not able in its present state to meet its chief foreign competitor on equal terms. Hence the recommendation for the imposition of the duty.

A Sign of the Times.

Under the heading of "Gas Regulation Act Applications" in last week's issue (p. 530), it was announced that the Gas Light and Coke Company are applying to the Board of Trade for a revision of their standard price from 11d. to 11·4d. per therm. The standard was revised downwards in 1923. Since then much has happened in connection with secondary products which has changed the situation; and the 11d. was not the figure to which the Company in 1923 considered they were entitled.

Gas Workers' Agreements.

As was announced some time ago, the National Union of General Workers decided to take a ballot on the question of whether national agreements should be continued through the National Joint Industrial Council, or whether district agreements or individual settlements should be substituted. We then predicted that the Union would be favourable to a continuation of national agreements. It is learned that, in sending out the ballot papers, they strongly recommended members to adhere to the national form. It will be a surprise if the members do not adopt the suggestion.

Rating of Machinery.

The long-debated question of the rating of machinery has been set at rest in the House of Commons by the passing of a resolution (on a free vote) exempting machinery from rating. This was carried by 324 votes to 106, or 3 to 1. The very general view was that the rating of machinery was antagonistic to industrial enterprise in equipment, and a clog on the sources of production, wages, and profits.

Sale of Worthless Shares.

Some time since, in referring to the efforts of certain company promoters to obtain capital from shareholders in well-established gas undertakings, we suggested that this was a matter which might well be considered by the Departmental Committee who were appointed to inquire into, and are now deliberating upon, the amendment of the Companies Acts. There is no question that, in this respect, the law requires amending, so as to protect unsuspecting persons from parting with their money for worthless securities or for securities at a price considerably above their market value. We see that the President of the Board of Trade has been interrogated in the House of Commons regarding the matter of the circularization of the public for the sale of securities which have no ascertainable value; and the question suggested that some promoters who are responsible for this nefarious class of business also send "salesmen" round the country for the purpose of inveigling people to buy. It was admitted by Sir P. Cunliffe-Lister that his attention had been drawn to statements in the Press relating to these practices. He thought that the warnings that had been made should influence investors to exercise extreme caution before parting with their money. At the same time, he promised that the question should be brought to the notice of the Departmental Committee, who, he acknowledged, have already had some evidence before them bearing on the subject. The hope of the gas industry is that the investigation will result in the incorporation in any amendment of the Companies Acts of power to deal, in the manner deserved, with parasites of the unscrupulous order referred to.

What a Foggy Day Costs.

The "Manchester Guardian" has been interesting itself in trying to ascertain what a foggy day costs the people of the city. But, of course, no complete calculation can be made, in view of the factors applying to such a question being in the main somewhat vague and complex. A fog has a stifling effect upon business in all directions; it has also most unpleasant consequences in promoting soiling conditions, which, in a big population, call for a large expenditure for labour in cleaning and renovation. But in two respects a fairly approximate computation can be made; and they are the additional consumption of gas and electricity, compared with a more or less normal day at a corresponding period. The inquiry made by our Manchester contemporary shows that on the fog-environed Friday, Nov. 20—"Black Friday" it might be called in that district—the quantity of gas consumed in the area supplied by the Corporation gas undertaking was 31,692,000 c.ft. On a normal winter's day, the consumption would be about 26,000,000 c.ft. Thus the increase in gas consumption was approximately 5,692,000 c.ft., which, at 3s. 4d. per 1000 c.ft. (the present net price), works out to about £950. In the case of the Electricity Department, the output was 1,544,680 units. A fair average consumption for a normal Friday in October and November is said to be 1,298,303 units. Therefore the consumption on Nov. 20 shows an increase of 246,377 units. The average price per unit received by the Electricity Department is about 1¼d., so that one may say that particularly foggy day cost the city at least £1250 in extra electric lighting. Adding this to the additional expenditure on gas, it is seen that Manchester will have to pay in the aggregate to the two Departments about £2200 extra for gas and electricity.

PERSONAL.

Mr. S. BARKER JOHNSON, Engineer and Manager to the Colombo Gas and Water Company, Ltd., Colombo, sailed for Ceylon last week, after six months' furlough in this country.

Mr. JOSEPH ROONEY, of Londonderry, has been appointed to the position of Manager and Secretary of the Drogheda Gas-Works. He has been Gas Manager of Roscrea, and later of Newbridge, and is one of a family of clever engineers who have made their mark in the gas or electrical industries.

Mr. B. W. GOTHARD, A.M.I.E.E., Electrical Engineer of the Aldershot Gas, Water, and District Lighting Company, who has been with the Company since June, 1913, has been appointed General Manager of the Electricity Distribution of North Wales and District, Ltd. The Directors have appointed Mr. A. V. BARRACLOUGH, A.M.I.M.E. (the Gas and Water Engineer), Chief Engineer of the Company; Mr. H. C. ALLERTON, Electrical Distribution Engineer; and Mr. A. E. WALL, Electrical Generating Engineer.

On Oct. 27 Mr. W. E. T. HEMS, Secretary of the Leamington Priors Gas Company, was presented with a cheque by the Directors, in recognition of his fifty years' service with the Company, which he completed on that date. A presentation by the employees was made to Mr. Hems on Friday, Nov. 20; this taking the form of a gold watch and chain.

At a meeting of the staff and employees of the Greenock Gas Department held on Nov. 24. Mr. NOEL S. SMITH, District Superintendent, was the recipient of a silver tea and coffee service, together with an umbrella for Mrs. Smith, the gift of the employees of the Department, on the occasion of his relinquishing the post to take up a similar appointment with the Luton Gas Company.

In the Institution of Civil Engineers' examinations for Associate Members held last October, Mr. CLIVE CLEMENT CUNNOLD, son of Mr. C. A. Cunnold, of the Gas Light and Coke Company, passed the first part (Class A). He is a student member of the Institution of Gas Engineers, and has just completed his articles with Mr. A. A. Johnston, of the Brentford Gas Company.

OBITUARY.

We are sorry to have to announce the death, on the 25th ult., after a long illness, of Mr. RICHARD SANDELL, who had been for a great number of years Secretary of the Lea Bridge District Gas Company. It was at the meeting of the Company in February, 1924, that the Chairman (Mr. A. M. Paddon) announced, to the regret of all, that Mr. Sandell could no longer carry on his duties. He had been with the Company for 56 years, and for 42 years had acted as Secretary. It would, added Mr. Paddon, be impossible for any undertaking to have had a more devoted or more efficient servant than Mr. Sandell. During all these years he had shown an almost affectionate interest in everything that appertained to the Company's welfare. There was a presentation by the works and clerical staff to Mr. Sandell in 1921, to commemorate his life-long service with the Company.

The death has taken place at Ashbourne of Mr. JOHN LISTER, who for many years was one of the Directors of the Ashbourne Gas Company, and was Chairman when the Urban District Council acquired the undertaking in 1913.

The death has occurred at Ellesmere of Mr. W. H. CARDER, of Tipton, who had long been associated with the iron and steel industries. He became Secretary of the South Staffordshire Iron and Steel Works Managers when there arose the demand for a closer association between the practical and theoretical sides of the industry; and it was a good deal due to his organization that the Institute (it is now known as the Staffordshire Iron and Steel Institute) became so influential. Mr. Carder was connected with the South Staffordshire Mond Gas Company from the earliest days of the introduction of the gas into the Black Country. He was Secretary to the Company, and lived to see it grow to a very large undertaking, of which he became a Director.

"A Land of Far Distances."—This is the title of a new book by William Stanford, Secretary of the Newport (Mon.) Gas Company, published by H. R. Allenson, Ltd.; price 6s. net. It is a fine companion volume to "The Strength of the Hills."

ELECTRICITY SUPPLY MEMORANDA.

PERIODICALLY, the electricity supply industry revives old proposals for stimulating the domestic consumption of electricity. At one time it is the question of tariffs, which, on every departure from the flat rate, simply confound the consumers. At another time, it is electric slot meters which attract.

Assisted Wiring.

Regarding them, a report by the Electrical Engineer of West Hartlepool (Mr. J. H. Parker) states: "The slot meter is a very unsatisfactory meter. It costs twice as much as an ordinary meter, and is expensive to maintain." On other occasions, it is assisted wiring and hire purchase which engage consideration; and both these are once more very much to the fore in the electrical papers. Both methods are regarded as absolutely necessary to the progress of domestic electrification. There seems, however, to be little hope of reducing the costs of wiring, unless it be by degrading installation much below the standards set by the regulations of the Institution of Electrical Engineers, to which regulations the Fire Insurance Offices have subscribed. This being the position, the electrical industry sees very little prospect of gathering in new consumers in good numbers unless in some way they are assisted in respect of the initial cost of wiring and equipping their houses. So much is this the case that one electrical writer says there has been, in many places in the country, a remarkable revival of the assisted wiring idea; and he predicts that the next six months will see a greater flood of such schemes, as well as hire-purchase facilities for cooking and heating apparatus.

An Example of Assisted Wiring.

An example of assisted wiring comes from Sunderland. It applies to installations in houses of three to six rooms; and it has been adopted in connection with a street-lighting programme for the whole of the streets in the borough. It is estimated that the cost of wiring will range from £5 14s. 7d. for a three-roomed house to £9 16s. 2d. for a six-roomed house; and the owner or tenant is to have the option of purchasing the installation at any time. The charge to the tenants for the hire and maintenance of the installation is 1s. 6d. weekly for summer quarters, and 2s. weekly for the winter quarters, with electricity charged at the rate of ¾d. per KW.-H. The Town Council are prepared initially to spend on this work £8000. The 1s. 6d. and 2s. includes something more than hire and maintenance; it is equivalent to the fixed charge in a two-part tariff. The weekly payments amount to £4 11s. per annum; and, if we assume that in a six-roomed house the tenant uses for lighting 200 units a year at ¾d., this would make an additional payment of 12s. 6d. The two sums amount to £5 3s. 6d. Supposing interest, sinking fund, and maintenance require 20 p.ct. on the expenditure of £9 16s. 2d., this would be £1 19s. 3d. a year. Deducting this from the £5 3s. 6d.—the total revenue in our illustration—there remains £3 4s. 3d. Dividing this by the 200 units, we get 3·85d. as the revenue per unit consumed. In the "Electrician Annual Tables of Electricity Undertakings for 1925," we see that the flat lighting rate at Sunderland was 6½d. per unit, or 4⅜d. net. If 20 p.ct. for interest, sinking fund, and maintenance is correct, then the question arises as to whether the consumers in this assisted wiring scheme are not, in their circumstances, receiving preferential consideration in respect of the payment for current used. It is frequently found, on examining the details of the charges involved in these schemes, that they do not, with a fair allocation of all costs, justify the description of a profitable venture.

Gas Competition Shapes Policy.

On investigating this matter of the charges for assisted wiring and hiring facilities generally, we are led to the view that the writer of "Cooking and Heating Notes" in the "Electrical Times" is correct in the indication he recently made in an article that gas competition, rather than sound financial principles, shapes policy in connection with these matters. Dealing with the subject of hiring and installation facilities for cookers, he states: "The fundamental fact that must always be kept in mind, when considering schemes for the development of the cooker business, is gas competition. For this reason, it is necessary to offer electric cookers to the general public at terms and on conditions no less favourable than those existing in the case of gas apparatus." He recognizes that it may not always be possible completely to achieve this; but he holds that it "represents the guiding principle on which cooker hiring and installation facilities should be based." The wide variations that exist in the electrical industry in respect of hiring facilities for domestic apparatus are pointed out by him. One extreme, he asserts, is represented by hiring charges fixed sufficiently high to cover interest on the cost of the cooker, depreciation, and maintenance; the user, in addition, being left to bear the full wiring and installation charges. The other extreme is the supply and installation of cookers free of cost to the consumer, with either a specified number of units to be consumed per quarter, or a slightly higher flat rate to recoup the undertaking for capital expenditure and maintenance costs. In the majority of cases, however, moderate hire terms are offered—insufficient (it is admitted by the writer) completely to cover interest, depreciation, and maintenance—and free installation and wiring up to a reasonable limit included. Supplementing his recommendation (without any consideration of a sound financial policy being pursued) that the actual hire charges should be fixed competitive with existing rates for gas cookers, the writer would commit the electricity undertaking to a policy of wiring an installation free of all cost to the consumer, with the simple condition attached that a limit should be fixed to the length of run supplied free as a safeguard against abnormal conditions of installation. We should not be inclined to trust that writer with the management of a commercial enterprise. The result of his recommendations would certainly bear heavily on the consumers as a whole, as the expenditure would have to be a charge on the general revenue of the undertaking.

Manufacturers and Hire Purchase.

Hire purchase of apparatus is another revival. It is being talked about at meetings, and is the subject of recommendations to the administrative bodies in many places, and is here and there being adopted. Some look upon it as a clever innovation, and not as an ancient trading expedient. The fact is that the novelty of the practice among the public wore off long ago. Electricity undertakings find, as other people have done, that such practices are useful; but application in their cases possesses the unfavourable points that their goods are already dear, and it is necessary under hire purchase to charge more. They have also the reputation of unreliability, and of needing considerable care—despite the testimonials which are published, and which could be easily countered if the gas industry chose to publish letters received from users of electric appliances who have sought to have gas apparatus re-installed, and have had the gratification of welcoming again their old friends. In "Electrical Industries," an article on the subject by Peter Power—a most appropriate name—points to the unwillingness of the customers now wanted by electricity to face the initial outlay, which, of course, requires hard cash. He looks to hire purchase to supply the alternative. As it is, he says, everything imaginable, except electric fittings, can be obtained for so much down and the balance later on. The bulk of the people, however, even with hire-purchase on offer, will only have essentials, and electric cookers, fires, and water-heaters are not essentials, while more economical means with a larger range of utility are obtainable. But Peter Power is of opinion that it is likely that the hire-purchase business in electric wiring and fittings will fall into the hands of a few large enterprising firms, inasmuch as local contractors cannot afford the necessary capital for this kind of business. Peter Power evidently is not keen on the large enterprising firms getting the business into their hands. He would rather see the manufacturers of electric appliances tackle the job, and the local contractors act as their agents. His experience of the electricity supply authorities who run a hire-purchase branch is that they do not exactly welcome or canvass consumers who are prepared to take advantage of hire-purchase terms; and the terms they allow are hedged round with restrictions and bound by red tape. Now let us try to visualize what would happen if the manufacturers and local contractors came to an arrangement to carry-on a hire-purchase business. In the first place, we doubt whether the manufacturers in the electricity industry would be prepared to find the capital for such business, repayment of which would be outstanding for a long period; and therefore good interest would have to be obtained. It would also add largely to their establishment charges. The manufacturers are not in the position of the local electricity supply undertaking, who should be reaping profit continually from the date of the installation of an appliance. There would not be the same security for the manufacturers working through contractors as through a statutorily empowered electricity supply concern. The contractors already grumble bitterly over the lean terms allowed them by the manufacturers on the outright sale of appliances; what the terms would be like when the rival manufacturers started competing for hire-purchase business we dare not think. Yet the contractors would not care to act as collectors of the hire-purchase payments unless the manufacturers made it worth their while. The manufacturers themselves could not keep adequate control, not having shops or offices in every city and town from Land's End to John o' Groats. From all points of consideration, we are satisfied that such business can only be carried on by centralized organization such as an electricity undertaking, which possesses the necessary facilities for following it up from installation to the completion of the purchase.

A Better Combination.

A much better plan by which electrical contractors can take part in the development of the domestic day load is in conjunction with the electricity supply undertaking. In the first paragraph of the "Memoranda" this week, reference is made to a statement by Mr. J. H. Parker, of West Hartlepool, regarding the character of the electric slot meter. Mr. Parker was formerly Chief Assistant in the Croydon Electricity Department, and has only been in West Hartlepool two or three months. One of his first acts has been to report on the question of securing, through the domestic

tariff of the Department (which he thinks a particularly attractive one), additional day consumption of electricity. Through the Chairman of the Committee, a meeting was arranged between Mr. Parker and the local contractors to discuss means of co-operating in this work. The proposals which were agreed commit the contractors to co-operate with the Department in developing the domestic load, and to place at the disposal of Mr. Parker the necessary assistance required from time to time for the work. On the other hand, the Corporation will purchase all the apparatus they wish to sell, hire-purchase, hire, or lend for propaganda purposes. On sales, except to Corporation Departments, a trade discount will be credited to the contractors. On all hire purchases, the trade discount (less 5 p.ct. per annum) will also be credited to the contractors. But there will be no allowance on apparatus which is let on hire. Among the proposals for joint working are: (1) Lending 200 electric irons systematically to all consumers who have not one, with a view to purchase or hire-purchase after a fair trial; (2) lending a limited number of bowl fires to likely consumers as propaganda for electric heating with a view to the sale or hire-purchase of radiators; (3) giving assistance to contractors to canvass on the route of cables all houses that are not yet using electricity; and (4) lending a limited number of time-switches for short periods to leading shops to encourage window lighting after shop hours. Mr. Parker states that during the last six months there has been on the North-East Coast a great revival of interest in assisted wiring, and many towns are finding it popular and profitable. He finds that an ordinary house, requiring from eight to ten lights, can now be wired (complete with lamps and plain, but neat, fittings) for from £8 to £10. Assisted wiring, he says, could be carried out by the local contractors at schedule rates under his supervision; and if the hire-purchase is fixed at 5s. per week, the installation will be paid for in from seven to ten months. He suggested that he should be authorized to proceed with a trial of not more than a hundred houses or shops; the cost of no installation to exceed £10. His recommendations have been adopted. Subsequent to their submission to his Committee and the Town Council, the following schedule for hire-purchase of installations was drawn up:

Number of Lights in Installation.	Total Price for Complete Installation.	Approximate Period for Payment at 5s. per Week.
6	£6 0 0	6 months.
7	£6 18 0	7 ,,
8	£7 16 0	8 ,,
9	£8 13 0	9 ,,
10	£9 10 0	9½ ,,
11	£10 6 0	10 ,,

Hall lights will be controlled by two switches—one upstairs and one downstairs. Each plug point for heating will count as one light. The work will be carried out by the local electrical contractors to the specification of the borough electrical engineer, and will be inspected and tested by the staff of the electricity department and guaranteed against defective material and workmanship for a period of twelve months.

EVENING STAR LODGE, No. 1719.

The election meeting of the Evening Star Lodge, No. 1719, was held last Wednesday in the Grand Temple of Freemasons' Hall, Great Queen Street, London.

W. Bro. Hermann L. Sheppard was in his place as W.M.; W. Bro. A. C. Beal, P.M., occupied the position of S.W., owing to the absence through indisposition of Bro. A. H. Henry, S.W.; and Bro. Frederick G. Cockey carried out the duties of his office as J.W.

The usual preliminary business having been disposed of, two candidates—Bro. Wilfred B. Claridge and Bro. James W. Swan—were duly elevated to the degree of M.M. by W. Bro. Sheppard.

The election of W.M. and of Treasurer for the year 1926-27 resulted in the unanimous return of Bro. A. H. Henry, S.W., for the former office, and of W. Bro. Arthur E. Croager, P.M., P.P.G.D., Kent, for the latter, in succession to W. Bro. E. G. Smithard, P.M., P.P.G. Treas., Norfolk, who retires after two years' occupancy of the post.

At the dinner which followed in the Connaught Rooms, the W.M. occupied the chair.

The Loyal Toast was on this occasion silently honoured, as an affectionate tribute to the memory of Queen Alexandra, and in testimony of sympathy with members of the Royal Family in their bereavement.

Following the usual Lodge toasts, that of "The Master Elect" was proposed from the Chair, and was very heartily received; hopes being expressed that Bro. Henry's health would speedily be restored.

The health of "The Visiting Brethren" was pledged at the call of W. Bro. Arthur E. Broadberry, P.M., L.R., response being respectively made by W. Bro. Robt. G. Shadbolt, P.P.G.D., West Lancs., and P.P.G.W., Lincs.; W. Bro. Frederick H. Sheppard, P.P.D.G.Dir.Cer., Hants; W. Bro. J. H. Savers, P.P.A.G.Dir.Cer., West Lancs., representing the Northern Star Lodge, No. 3053; and W. Bro. H. Heys, P.M., L.R., Wimbledon Lodge, No. 3160.

The contents of the charity box were sent to St. Dunstan's Home for blinded sailors and soldiers.

FLOW OF GAS IN PIPES.

By STEPHEN LACEY, B.Sc., Assoc.M.Inst.C.E.

The fundamental theoretical treatment of flow of gas in pipes, involving as it does an understanding of all the physical properties of gases, can be made to afford an excellent training for students of gas engineering and supply, besides enabling gas engineers to solve with accuracy distribution problems that arise in practice. But the theoretical considerations are inevitably complex, and it therefore behoves those who have made a study of the subject, and wish to impart their knowledge to others, to explain the matter in the simplest way possible, and to relate their own contribution to what has already been published in the technical journals. For these reasons I regret that Mr. Gadd did not base his interesting article published in your issue for Sept. 16 upon the work already done in the same field; and in the hope of showing students of the subject that it is not so impossibly abstruse as it looks at first sight, I propose to recapitulate some of the arguments in my paper presented to the Institution of Gas Engineers at the Belfast Meeting in 1923.

In that paper I attempted to clarify the state of confusion created by the development of an endless succession of empirical formulæ, each made to fit a particular set of experimental data, by showing how relatively simple the treatment of the whole problem becomes when viewed in the light of the work of Dr. Stanton and Prof. Pannell, to which Mr. Gadd has referred.

I described the phenomena of streamline flow and turbulent flow, and showed how the critical velocity, at which the one type of flow gives place to the other, is determined. I demonstrated that no serious difficulties arise in connection with streamline flow, and gave formulæ and graphs by the aid of which flows in pipes below the critical velocity can be accurately determined.

The following fundamental formula for *turbulent* flow was given:

$$\zeta \frac{v^2}{2g} = \frac{D}{4L} \cdot \frac{P_1 - P_2}{W} \quad \ldots\ldots\ldots 1$$

where ζ = coefficient of friction,
v = mean velocity of gas,
g = acceleration of gravity,
D = diameter of pipe,
L = length of pipe,
W = density of gas,
$(P_1 - P_2)$ = pressure drop in length of pipe, after correction for difference in elevation.

It was explained how all the difficulties in connection with solving flow problems arise out of the fact that the coefficient of friction ζ is not a true constant, but varies with the diameter of the pipe, with the density, velocity, and viscosity of the gas, and with the degree of roughness of the internal surface of the pipe.

From the fundamental formula (1) were developed the following formulæ in the gas units I adopted—viz.:

$$Q = 188\sqrt{\frac{hd^5}{\zeta SL}} \quad \ldots\ldots\ldots 2$$

the low-pressure formula to suit conditions where the variation in density of the gas in the length of the pipe is negligible, and

$$Q = 2675\sqrt{\frac{d^5}{\zeta SL} \cdot \frac{p_1^2 - p_2^2}{p_a^2}} \quad \ldots\ldots\ldots 3$$

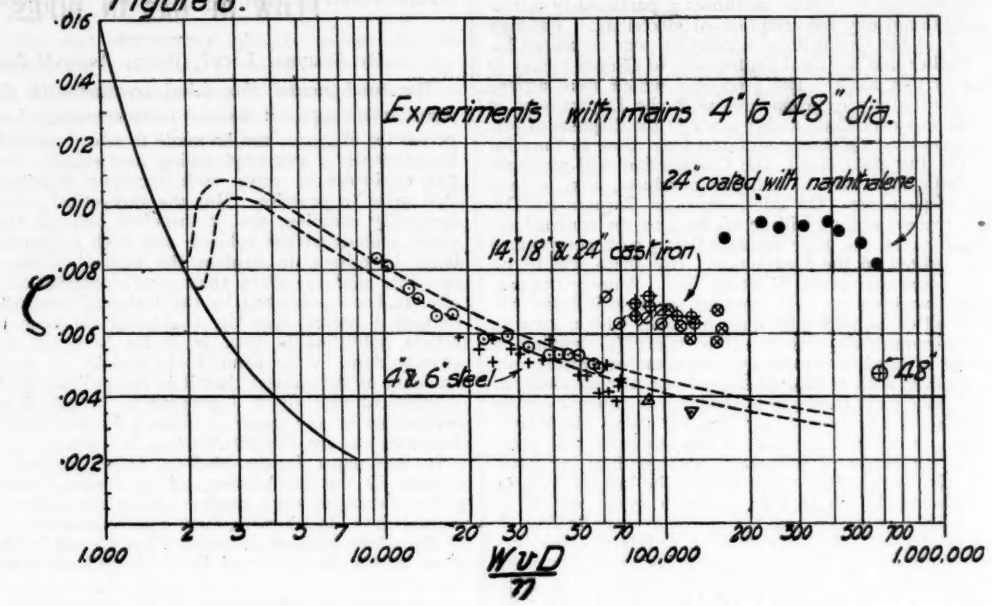
the high-pressure formula (known as Unwin's) to suit conditions where the change in density is considerable, and must be taken into account.

Pole's formula was shown to be directly derivable from (2) when ζ is given the value 0·0065; and I defined the limits within which this formula can be safely used in practice. In low-pressure distribution, the gas engineer generally uses a flow formula for calculating the carrying capacity of trunk mains of diameters varying from 12 in. to 24 in.; and for such conditions Pole's formula is as accurate as need be for all practical purposes.

When dealing with conditions of turbulent flow where Pole's formula is inapplicable, it is necessary to return to the fundamental formulæ (2) or (3), using the value of ζ appropriate to the particular circumstances of each case.

I explained how Dr. Stanton's work enables the appropriate value of ζ to be determined for any particular set of conditions. ζ was shown to be a function of $\frac{WvD}{\eta}$ (where η = the coefficient of viscosity); and I published graphs (see figs. 3 to 6 in my paper) which enables ζ to be readily evaluated. Though the semi-graphical way of evaluating ζ was chosen because it appeared to be the more easily workable, there is the alternative of devising a flow formula in which ζ is expressed in terms of $\frac{WvD}{\eta}$. Dr. C. H. Lees has done this, and it is interesting to show how his formula, quoted by Mr. Gadd, compares with the fundamental formula above.

Figure 6.



By transposition and change of symbols, Dr. Lees' formula* can be expressed as follows:

$$\left\{0{\cdot}0018 + 0{\cdot}153\left(\frac{WvD}{\eta}\right)^{-0{\cdot}35}\right\}\frac{v^2}{2g} = \frac{D}{4L}\cdot\frac{P_1 - P_2}{W} \quad . \quad 4$$

from which it will be seen by comparison with the fundamental formula (1) that

$$\zeta = 0{\cdot}0018 + 0{\cdot}153\left(\frac{WvD}{\eta}\right)^{-0{\cdot}35} \quad . \quad . \quad . \quad . \quad 5$$

The significance and limitations of equation (5) can best be shown by reference to fig. 6 (reproduced below), from my paper "Flow of Gas in Pipes."

Abscissae on this graph represent values of $\frac{WvD}{\eta}$, and ordinates values of ζ. The two dotted curves represent the limits within which fell all points plotted from the results of Dr. Stanton's experiments on flow of water and air in commercially smooth drawn-brass pipes of various diameters.

Dr. Lees' formula for ζ is the equation corresponding as nearly as possible to the mean of these two curves, for values of $\frac{WvD}{\eta}$ = about 4000 and upwards.

For example, when $\frac{WvD}{\eta}$ = 100,000, the value of ζ from Stanton's curve is seen to be about 0·0043; and about the same value of ζ would be obtained by calculation from Dr. Lees' formula (5).

Now the value of ζ corresponding to a particular value of $\frac{WvD}{\eta}$ varies with the degree of roughness of the pipe—*e.g.*, it will be seen from fig. 6 that for old cast-iron mains ζ is above 0·006 when $\frac{WvD}{\eta}$ = 100,000, as compared with 0·004 for very smooth pipes. Therefore it follows that Dr. Lees' flow formula can only be properly used for the determination of flow in pipes of the same relative roughness as those with which Dr. Stanton experimented.

It may be found useful if I compare the semi-graphical method I have adopted for evaluating ζ with Dr. Lees' completely mathematical method, by giving a concrete example.

In gas practice the necessity for forsaking Pole's formula arises when dealing with problems of long-distance gas transmission. In such circumstances relatively high initial pressures become economical, and the consequent variation in density of the gas along the main makes it necessary to use the high pressure formula (3). Assume that it is proposed to transmit 1,000,000 c.ft. of gas per hour a distance of 500,000 ft. (about 100 miles), and that it is required to find the initial pressures corresponding to pipes of various diameters.

Suppose diameter of main = 18 in.
Specific gravity of gas = 0·5
Viscosity = 0·000136

Assume also that the temperature of the gas is constant at 60° Fahr. throughout the length of the main.

The first step is to calculate the value of $\frac{WvD}{\eta}$ from the formula

$$\frac{WvD}{\eta} = 0{\cdot}00481\,\frac{SQ}{\eta d}$$
$$= 1{,}000{,}000 \text{ nearly.}$$

(Alternatively the value of $\frac{WvD}{\eta}$ can be found without calculation by reference to the first diagram on plate 4.)

The appropriate value of ζ can now be found by reference to fig. 6. It will be seen that a vertical line through $\frac{WvD}{\eta} = 10^6$ cuts the Stanton curve extended at a value of ζ equal to about 0·003. This value should only be used where very smooth pipes were employed, and no considerable roughening by corrosion was anticipated.

Suppose that in the concrete case under consideration it is thought desirable to allow for some bends and roughening of the internal surface of pipe in use, and ζ is taken to be 0·005, the value of $(p_1^2 - p_2^2)$ can then be calculated from equation (3)

$$Q = 2675\sqrt{\frac{d^5}{sSL}\cdot\frac{p_1^2 - p_v^2}{p_a^2}}$$

or, alternatively, from graphs on plate 4. If $p_2 = p_a$ p_1 the initial pressure will be found to be 142 lbs. per sq. in.

If Dr. Lees' method were used, would have to be calculated from the expression

$$\zeta = 0{\cdot}0018 + 0{\cdot}153\left(\frac{WvD}{\eta}\right)^{-0{\cdot}35}$$

and the value so obtained would be 0·0030, corresponding to the Stanton curve for smooth pipes. Thereafter the method of calculating initial pressure would be the same as above described—using the high-pressure formula (3).

I claim for the method I advocate that it has the great advantage of keeping continually in view the fact that the accuracy of flow prediction in any particular circumstances depends solely on the accuracy with which the coefficient of friction ζ can be evaluated.

Unwin's formula (3) can be used with mathematical certainty provided we have the means of determining the true value of the coefficient of friction ζ applicable to the circumstances of the particular problem under consideration.

* Dr. Lees' symbol V represents the kinematical viscosity = $\frac{\eta}{W}$

Mechanical World Year Book.

The 1926 Edition of this valuable little volume has just been published. New features introduced include a section on the "uniflow" engine, in which will be found concise notes and data relating to a type of steam engine which is finding increasing favour. An important new section, "Notes on Grinding," deals with this subject in detail, and includes many tables and much data concerning grinding allowances, information on various abrasives, &c. A further addition deals with forced and shrinkage fits, and another with chains and ropes for lifting. Some of the permanent sections have been partly rewritten, while others have been revised where necessary. The book is published by Emmott & Co., Ltd., No. 65, King Street, Manchester; price 1s. 6d. net.

Will.—Mr. Herbert Unwin, late Chairman of the Penistone and District Gas Company, left unsettled property of the gross value of £401,942, with net personalty £344,560.

THE "FAIRWEATHER" RECORDING CALORIMETER AS AN OFFICIAL INSTRUMENT.

By F. E. MILLS, B.Sc., A.M.I.Chem.E., Chief Chemist to the Brentford Gas Company.

As readers of the "JOURNAL" are aware, the "Fairweather" recording calorimeter was invented in 1920 by the late Mr. J. H. Fairweather, primarily as an instrument to comply with the provisions of the Gas Regulation Act—*i.e.*, as an official recording calorimeter. Unfortunately, when the first instrument was delivered, Mr. Fairweather was suffering ill-health. Most of the preliminary trials had to be performed in his absence, and the instrument was still in the experimental stage at the time of his death early in 1921, so that he was unable to see the completion of his idea working satisfactorily. The writer carried on his work at Brentford, however, with the assistance of Mr. S. Withycombe and the makers, with sufficient success to warrant a trial of the instrument as an official recorder at Brentford in 1922. Research work has been continued; and after more than three years' trial, the Gas Referees have now issued a new Prescription relating to the Brentford Gas Company, embodying the experience gained.

While the recorder has an even greater use to the engineer as a control instrument, enabling him to maintain the declared value more uniformly, and to trace troubles more rapidly, the object of this article is to give a description of its present official use at Brentford, particularly with reference to the precautions given by the Gas Referees against the Gas Company being unfairly penalized by possible inaccuracies of the recorder.

In the first place, there are three official recorders in use; one at Brentford, and one each on the two mains taking gas from Southall, all being in separate locked partitioned spaces, to which the Gas Examiner only has the keys. It is arranged, however, that the current portion of the chart and the previous week's chart are exposed to view, all others being handed over to the Gas Company. In this way, the Engineer is informed both of his calorific value at any time and his average to date. The effect of this is soon shown in his quarterly averages. For instance:

Declared Value – 500 *B.Th.U.*

1925.	Brentford.	Southall.		Average.
		(A)	(B)	
June quarter	500·4	502·5	503·2	501·8
September quarter . .	500·2	500·6	500·6	500 4
Six months	500·3	501·5	501·9	501·1

The advantage of being able to keep the calorific value constant and down to the declared value will be obvious. Further, the possibility of trouble on the score of deficiency of 5 p.ct. for two hours becomes much more remote, as the recorder indicates the drop in calorific value before the 5 p.ct. margin is reached, giving time for rectification.

The recorders are first erected and set going by the Gas Company, and handed over to the Gas examiner in working order. The latter then merely makes verifying tests, computes the various averages, and makes small adjustments. Extensive adjustments and repairs (if necessary) are done by the Gas Company or the makers.

Verifying tests are made twice a week, and consist merely in making a test (in accordance with the General Notification of the Gas Referees, slightly modified to allow for the fact that the air for combustion is saturated with water vapour) on the calorimeter portion and comparing this with the reading of the chart at the time. This is possible since the instrument is a recording Boys' calorimeter. The readings are so arranged that the Gas Examiner can simultaneously check the four components of the recorder:

1. Gas rate.
2. Water rate.
3. Tabular control.
4. Recording mechanism.

If the error in any component amounts to 1 p.ct. or more, it must be eliminated and another test taken. It is found by experience that this method (allowing the various components to be slightly in error, and subsequently correcting for them) is more conducive to accurate working than attempting to keep the instrument dead accurate. The fact that the recorders are locked up and away from interfering fingers assists greatly in their accuracy.

The algebraic sum of the above four errors equals the total error on the instrument, and should agree with the difference between the actual test and the chart reading. Should this total error amount to more than 2 p.ct., the record since the last test is not used for official purposes, and the calorific value for the interval is obtained by taking the mean of the two verifying tests. Evidence of the reliability of the recorders is given by the comparative rareness of such occasions.

If the total error is not more than 2 p.ct., the chart is used for computing the average daily calorific value as follows: A week's chart is cut off and a transparent celluloid scale is laid over each period of six hours on the chart in such a way that the areas enclosed by a line on the scale and the curve on the record sheet above and below are equal. The scale is graduated to read the calorific value for the six hours directly. The reading is then corrected (1) for accidental displacement of the chart (leading to slightly inaccurate datum line), and (2) for the mean of the total errors described above, obtained at the beginning and the end of the interval. The average of four items so obtained constitutes the average for the day, and is reported as so much per cent. above or below the declared value. These daily figures are averaged as the quarter proceeds.

The chart at the same time is examined for low values by the transparent scale. This contains a square of half-an-inch side, which can be included between the record line and the centre line of the chart, if the calorific value has been 5 p.ct. below the declared value for two hours or more. A protection is here given to the Gas Company—that if they observe a recorded deficiency of 5 p.ct. or more which does not agree with their own tests, they shall inform the Gas Examiner, so that the recorder can be checked immediately.

At the end of each quarter, the instrument is stopped and all the essential parts cleaned and overhauled, the gas system tested for leaks and the meter proved. Since the latter is a pendulum escapement meter, it cannot be proved accurately with the Gas Referee's bottle. The method employed, therefore, is to check an ordinary test meter with the bottle and then to run it in series with the escapement meter when working normally, due allowance being made for the temperatures and pressures of the two meters. The water line of the escapement meter is then noted and used for the following quarter. Any lowering of the water line due to evaporation between verifying tests is of course allowed for in each test and rectified; but since the gas reaches the meter as far as possible saturated with water vapours, adjustments are reduced to a minimum.

After starting-up a recorder at any time, the various components are allowed time to settle down; the first verifying test not being made within twenty-four hours of starting-up. To ensure safety in leaving a recorder locked up, there is the usual device for shutting off the gas when the water fails.

Since the "Fairweather" recorder is a recording Boys' calorimeter, and check tests are made in accordance with the General Notification (slightly modified), it will be realized that comparison tests between the recorders and non-recording Boys' calorimeters should agree on an average. That this is so may be seen from the following average comparisons:

Six Months ended Sept. 30, 1925.	Recorder A.	Recorder B.
Average of recorder chart	501·5	501·9
Average of non-recorder daily tests (1100 tests on each recorder)	501 8	502·1

Similarly, two recorders on the same gas should give the same average. The two recorders at Southall give a good indication of this. While it is possible to send different gas through the mains leading to the two instruments, this is now rarely done, and the two recorders are virtually on the same gas. The following comparison of the results on each indicates the consistency of the recorders.

—	Recorder A	Recorder B
June quarter, 1925	502·5	503·2
September quarter, 1925	500·6	500·6
Average	501·5	501 9

Regarding the question of spot test comparisons between a recorder and a Boys' calorimeter, such comparisons are not in general of great value, and are sometimes very misleading, since the instructions for using the Boys' instrument contain factors which assume average conditions of humidity, room temperature, water temperature, thermometer stem corrections, rates of flow, &c. In many cases of wide divergence between a recorder and a non-recorder it has been found that the discrepancy could be largely traced to the divergence of the conditions of the test from the mean assumed in the factors.

Carbonan.—Advices from Horten, Norway, to the American Chemical Society, state that a new liquid motor fuel, invented by a Russian engineer named Makhonin, has proved successful in French navy tests. This fuel, to which the name of "carbonan" has been given, attracts, it is said, much interest in countries not producing oil, since coal tar and the tar oils produced by the destructive distillation of wood and peat may be converted into a high-grade fuel. "Carbonan," which is not inflammable at ordinary temperatures, can be used in explosion motors without changing the construction of the carburettor. A statement from the French navy, by whim the fuel has been tried in submarine motors, declares that "Carbonan" gives 10 to 15 p.ct. higher efficiency than benzene. The inventor is of opinion that it will show a still higher efficiency—about 40 p.ct. more than benzene—in a motor specially designed to suit the new fuel.

BRITISH EMPIRE EXHIBITION AS A GAS CONSUMER.

By G. L. JENNINGS, of Brentford.

Now that the Exhibition is over, it will probably interest some of your readers to hear how gas (apart from the Gas Exhibit) fared during the period that the Exhibition was open during 1925.

It will be remembered that the original catering contractors —Messrs. Lyons—did not see their way to participate in the second year, and that various other caterers were appointed. The gas equipment installed by Messrs. Lyons, however, remained, and was used by the new contractors. It would be giving away no secret to say the new contractors admitted that they were under a deep debt of gratitude to their predecessors. They found installed a thoroughly efficient system, and had merely to suit their own methods to it; and in this they succeeded. Gas was used for practically the whole of the catering, and by all the caterers.

SALES OF GAS.

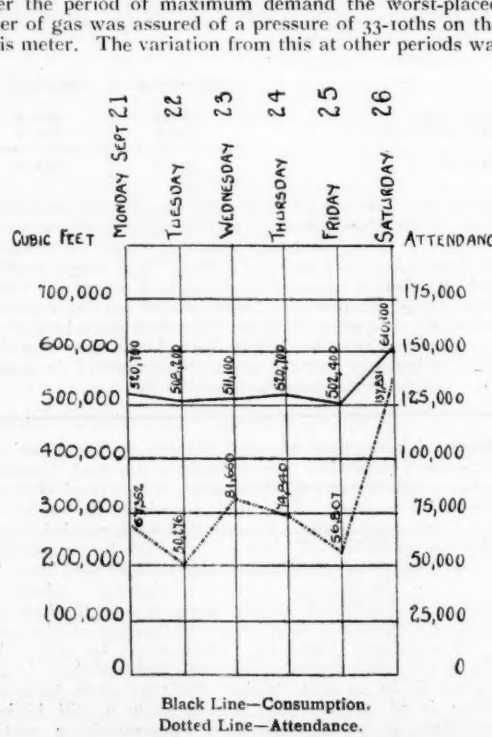
The amount sold was in every way satisfactory, especially having regard to the smaller number of visitors to the Exhibition. The consumption per head of visitors was more than double that of the first year; and though there is no definite ratio, there is, of course, a natural relationship between the attendance at an exhibition and the sale of gas. This is to some extent explained by the fact that on days when the attendance is small the catering staff are occupied in preparing and cooking viands which are served on busier days—such as cold meats, hams, &c.

On some days the sale of gas was higher than in 1924. The record day was on Sept. 14, when no less than 670,900 c.ft. were consumed in the Exhibition. This was higher than on any day during 1924. The total sale for 1925 was no less than 71 million c.ft.; and as the Exhibition was open on 152 days, it follows that the average consumption of gas per day was 467,100 c.ft.

LAY-OUT AND PRESSURES.

It is pleasing to be able to state that no complaint of inadequate supply was received by the Brentford Gas Company during the two years of the Exhibition's existence. The original lay-out of the mains was based on a possible consumption of 700,000 c.ft. per day, and the difficulty was in so planning the positions that no shortage would be felt at any point. The load at an exhibition is not even throughout the day, and it is safer to work on an hourly load rather than a daily one. If a daily load is taken, it should be divided by seven to get the hourly load.

A few figures and details may be of interest to readers. The Brentford Gas Company set out to maintain an initial pressure at the Exhibition main meters of 45-10ths; and this was very closely adhered to. The greatest loss of pressure found in the grounds at the period of largest demand was 12-10ths, so that under the period of maximum demand the worst-placed consumer of gas was assured of a pressure of 33-10ths on the inlet of his meter. The variation from this at other periods was very small. Practically no governors were used, except on the Gas Exhibit, where extreme uniformity of pressure was desirable.



Black Line—Consumption.
Dotted Line—Attendance.

Chart Showing Comparison of Gas Sold and Attendance Daily.

AN INTERESTING CHART.

I attach a chart showing a normal week—the particular one is for the third week in September. It will be see at once that, though the use of gas on Tuesdays and Fridays was smaller, it was not in a direct ratio to the attendance.

SOME ACTUAL CONSUMPTIONS.

Some of the actual consumptions may be of interest. They are as follows:

Aerated Bread Company	5,283,400 c.ft.
Buzzards	1,786,800 ,,
Express Dairy	714,900 ,,
Bertram & Co.	2,273,000 ,,
Dominion Catering Supply, Ltd.	3,988,100 ,,
Gordon Hotels, Ltd.	8,314,400 ,,
Mac Fisheries, Ltd.	5,612,000 ,,
Allnatts, Ltd.	1,284,900 ,,
Symons & Co.	1,409,400 ,,
Australia	1,441,900 ,,
Haymarket Hotels	2,242,700 ,,
Pritchards	2,870,600 ,,
New Zealand.	905,500 ,,

A SUGGESTION FOR THE FUTURE.

I would like to impress the necessity for the gas industry to be represented on the advisory boards of all exhibitions. It has far too long been the practice to allow advisory committees to be selected with no official recognition of the gas industry, and then to do the best possible in the circumstances. But if gas was properly represented during the early stages, the work would cease to be the uphill fight it is at present. It should not be left to an individual company to maintain the prestige of the industry. All the gas undertakings of the kingdom should unite to secure proper representation, in a manner similar to the way in which the gas industry was represented on the Gas Exhibit.

If all parties concerned can do this in an exhibit, they can surely do so in getting proper and adequate representation on exhibition committees. When we remember that a short time before the opening of the British Empire Exhibition it was stated that no gas whatever should be available in the grounds, and that it was only when the caterers stated that gas was an absolute necessity that it was properly considered, there is ground for grave reflection.

It is true that gas was represented, and had a large sale; but, having regard to the backing-up of the gas industry for the Exhibition as a whole (and it has probably been their largest and best exhibit), the use made of gas for illumination purposes was by no means satisfactory. Cannot there be a small committee formed to advance the industry in exhibition quarters?

Mr. Neville, in his address to the shareholders of the Brentford Gas Company last year, showed the enormous preponderance of heat units supplied by the Brentford Gas Company over their electrical competitors. Why be content with this? Unquestionably the best lighting of the grounds was in the Amusement Area, and this was given to gas by an electrical firm who were doubtful of the electric supply. Much more of the grounds should have been an advertisement for gas as the best, as well as the cheapest, form of artificial lighting.

Local surveyors and those in charge of public lighting should have been invited to the Exhibition to see the contrast between the two systems of artificial lighting. So far as I am aware, this was not done. Surely this was a unique opportunity to do so—better, perhaps, even than occurred at the White City Exhibition, though gas was used in the amusement area there as the better light.

In the British Empire Exhibition gas was, however, used under the low-pressure system, and not under high pressure as at the White City. Thus the lighting demonstrated at Wembley is available everywhere.

Finsbury Technical College.—The Streatfield Memorial Lecture will be delivered on Thursday, Dec. 3, at 4 p.m., by Mr. F. H. Carr, F.I.C. (Director of British Drug Houses, Ltd.). The subject will be the "Scientific Basis of Industry."

The Hotchkiss Circulator.—In a booklet entitled "Notes on Circulation," Mr. Arthur Ross, F.I.C., has something to say about the Hotchkiss circulator, which is manufactured by Messrs. Arthur Ross, Hotchkiss, & Co., Ltd., Old Kent Road, S.E. 15. By this circulator, movement of the water in the boiler is automatically induced without using up any considerable supply of heat. This movement is obtained by imprisoning and inducing a certain bulk of heated water to rise naturally, but in a controlled manner, without mechanical operation. A current of water from the surface in the boiler circulates through a vertical pipe, a bulb fitted with a baffle plate which brings down mud or any deposit, and then down another pipe to the lower part of the boiler. In this manner, as a result of the more rapid flow of the water over the surface adjacent to the source of heat, more heat units are transferred from the fire to the water.

PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS.

Conference of Associations of Local Authorities.

IN connection with the Public Works, Roads, and Transport Congress and Exhibition at the Royal Agricultural Hall, Islington, N., there was on Tuesday, Nov. 24, a conference under the auspices of the Associations of Local Authorities—presided over by Sir Henry P. Maybury, K.C.M.G., C.B., Director-General of Roads, Ministry of Transport—at which three papers on topical subjects were presented.

MAINS IN PUBLIC HIGHWAYS.

[The contributions stress the necessity for co-operation between all concerned in the surface and sub-surface of roads. The rights of no one body should preponderate. Interesting suggestions were made in the discussion.]

Two of the papers dealt with different aspects of the contentious subject of mains in public highways. One of these was an engineering paper, by Mr. Roland Fletcher, Assoc.M.Inst.C.E., Borough Engineer and Surveyor, Smethwick; and the other a legal paper, by Mr. G. P. Warner Terry, Barrister-at-Law, Statistical Officer and Assistant Clerk, Metropolitan Water Board. It is here only possible to touch briefly upon these two clever contributions, and upon the long and spirited discussion to which they gave rise.

DISCORD V. CO-OPERATION.

Mr. FLETCHER pointed out that the subject is of fairly wide general interest. While he is willing to admit freely the rights of the statutory authorities, he wants them just as freely to admit the highway rights, and to "foot the bill" if, and when, the highways are broken up by them for their benefit. The public at large are apt to blame the highway authority (and almost invariably through their engineer) for all defects in road surfaces; but while he is responsible for the maintenance of the surface of the highway, he unfortunately has not the control of trench openings which he would like, or which would appear to be desirable. The fact must not be lost sight of that co-ordination between highway and other departments responsible for the laying and maintenance of pipes and cables can do a great deal towards minimizing the inconvenience to the public and the damage caused by the openings made in highways. Much has been written and said as to co-operation between highway and other public service authorities; and the great majority of the authorities are to be commended for the very great interest shown, and for their readiness to assist by frequently expediting the laying of new mains or the relaying of old mains, in order to avoid the risk of having to break up newly-laid street surfaces. This is all to the good; but more may even yet be done in this direction, and Mr. Fletcher would like to see legislation which would strengthen the highway authorities' position to such an extent as to enable them actually to forbid the breaking-up of a new highway surface for a certain definite period of time after laying.

In the case of all new arterial or town-planning roads, service mains for sewers, gas, water, and electricity should be in duplicate, and disposed on either side of the carriageway, under grass or gravel margins, or the side walks. This principle has, of course, been followed of late in several notable cases. All mains and services laid under highways should be laid with the very best materials, and at a sufficient depth to be free from any risk of damage by road traffic. The author cited his own borough, where, he said, the whole of the 15,000 gas services are in process of being taken up and replaced (7000 having been dealt with in the last two years). This, he added, is largely due to the pipes not having been properly protected when first laid. Numerous cases could also be cited where gas and water mains have in the past been laid at too shallow a depth, with resultant fractures, and consequent breaking open of the road for repairs.

Speaking generally, Mr. Fletcher considers that anyone breaking open a highway should be compelled to: (1) Carry out the work with the minimum of inconvenience to road users; (2) temporarily make good the surface so as to render same perfectly safe and maintain in a safe condition until permanent reinstatement takes place; and (3) after a suitable lapse of time permanently reinstate the road surface foundations to a condition as nearly as possible conforming to the state of the surface and foundation before the operations commenced. With regard to (3) permanent reinstatement, he holds very strongly to the opinion that only the highway authority can and will properly and efficiently carry this out; and he would like to see all such work done by them—the full cost being charged up to the undertakings responsible. In large towns the supervision of the opening of trenches in highways and the proper refilling and reinstatement have become so considerable a matter that it is becoming a common practice for highway authorities to appoint special inspectors whose sole duty is to keep in touch with and control this work. Where the authority themselves undertake the reinstating, the charges for the work should be so fixed as to cover, as far as possible, this official's salary and expenses, in addition to the actual cost of labour and materials used.

In Mr. Fletcher's opinion, discord and argument between local authorities and the statutory undertakings, and their respective officers, can only be avoided by all parties working together with the fullest possible co-operation and with the best will.

RIGHTS OF PUBLIC UTILITY UNDERTAKINGS.

Mr. WARNER TERRY, in introducing his paper, said he wished it to be distinctly understood that he had written it entirely on his own responsibility, and with a view to provoking a discussion. There is, he finds, on the part of the highway authorities a disposition to think that the highways belong to the surface users only, and that those who have the use of the sub-surface are trespassers, and people who are entirely subservient to the surface users. This is not true. As to gas mains and electricity cables, these constitute a case of Parliament having gone out of its way to provide facilities for gas and electricity to be conveyed into the houses and factories. Then there are water, telephones, &c. These advantages can only be enjoyed by the use of the sub-surface of the highways. Going over the local government history of this country, it will be found that in nine cases out of ten private enterprise has pointed the way. Water companies, in particular, took great risks when local authorities themselves "jibbed." Public utility undertakings are rated heavily in respect of mains and services. Power is conferred on local authorities who supply gas and water to run their mains through private streets. A case could be easily made out on merits that the service rendered to the community by the sub-surface users transcends in importance that rendered by the surface users. Mains, pipes, and cables are the veins and arteries upon which our present civilization is becoming more and more dependent.

Putting all other considerations and arguments aside, declared the author, those that are most anxious to conserve the things that are should think twice before they seek to weaken in any sense or for any purpose the sanctity of a parliamentary bargain.

Discussion.

The CHAIRMAN remarked that with the concluding words of Mr. Warner Terry they would all be in sympathy. He had referred to the sanctity of parliamentary bargains.

Mr. DRYLAND said the subject before them was eminently one that had two sides. Was it not, after all, a question whether the mains were not in the wrong place—whether the carriageways in these days were the right position for mains? He would suggest they were not; and he would like to see a "parliamentary bargain" that no main or drain should be laid under the carriageway of a highway, until the parties concerned had satisfied some impartial authority that there was no other practicable position in which to place them. One could not put them in a place where they would cause more inconvenience to the public than under the carriageway. If there was no room for them under footpaths, why should they not go on private property? Why should not the owners of houses find a place for these pipes? There were many cases in which mains could be laid with great advantage in the front, or even at the back, of houses. They would be less costly both to lay and to get at, and they would not be subjected to the strain that came upon them under the carriageway. It would thus be cheaper all round. He did not think the ordinary ratepayer really understood what he paid in consequence of the operations of sub-surface users. The life of highways might be decreased one-half by these operations. The laying of a longitudinal main through an expensive road often had this effect; and the ratepayers had to pay for making it good.

A SUGGESTION FROM GRIMSBY.

Mr. WYATT (Grimsby) said that in his town they were carrying out a road widening scheme. They were making the road 60 ft. wide, and 40 ft. between kerbs, of reinforced concrete, with a bituminous surface; and he had the idea that they ought to have in the roadway no sewers or mains of any description. Therefore he proposed that under the centre of one footpath there should be the sewer, and under the centre of the other the surface water drainage. The Electricity Department should have the two outsides; the water main being in one footpath, and the gas main in the other. In order to serve both sides of the road, he had arranged that at comparatively frequent intervals conduits should be placed in the roadway—say, about 250 or 300 yards apart. The Water Company being on one side of the road would put through the conduit a small pipe. Correspondingly the Gas Company on the other side would put a small pipe through the conduit. Thus each would serve the houses on both sides of the street. He thought in this way they would never have any openings in the carriageway; but the

scheme did not come to anything because the Gas and Water Companies preferred to lay a main under each footway. It was, of course, a little more expensive than the method he had proposed; but they thought it would be more satisfactory.

Mr. HUMPHRIES (City Engineer, Birmingham) said those who had charge of the surface of the highways did not dispute that the utility undertakings had a right to be underneath. All they asked for was proper co-ordination and proper ways of dealing with this matter. In Birmingham they had adopted regulations which could be applied to most towns—namely, that all notices in regard to trenches of any kind that were to be made should be sent to the surveyor, who notified all the other undertakers who might be interested, so that all disturbances of any particular street might be carried out at the same time. Mr. Dryland had suggested laying mains in other places than under the highways. In a town planning scheme he adopted such arrangements for sewers; but the difficulties were very great, and he thought they would be far greater with pipes of other kinds. The best and cheapest way was to lay the mains under the footpaths on either side of the road. ["Hear, hear."]

Mr. BURTON (Stoke-on-Trent) said when roads were going to be repaired they gave the various undertakers reasonable notice, and asked if they had anything to do to their mains. They might say they did not want to do anything; but shortly afterwards some one would come along with something subsequently thought of.

MAINS BEHIND FRONTAGE LINES.

Col. MARTIN (Salford) said Mr. Terry had assumed that all highway engineers had said that all utility undertakers were trespassers; whereas they never had said anything of the sort. What they should do was to set themselves to see what could be done to lessen the disturbance, and to put the matter on as businesslike a footing as possible. It was a fairly general rule now that all frontage lines should be 15 ft. or more back from the street line. Surely this space could be made use of for mains of all sorts, rather than put them under the highways. The roads were so full of pipes, and the results were such, that the ratepayers were kicking. They would not stand for ever what had been going on during the last 25 years—and rightly so. It ought not to be beyond the wit of business men to find some alternative to the disgusting state of affairs that existed at present.

Mr. WILKINSON (Willesden) remarked that there was one thing Mr. Terry had not mentioned—who should pay the cost of moving mains when widening a road. Many councils wrongly paid this; but the cost should be borne by the statutory undertakings, if they wanted the cables or mains moved with the widening operation.

The CHAIRMAN, in moving a vote of thanks to the authors, said he supposed, as officers and members of local authorities, they must, and did, recognize the rights of these statutory undertakings to lay their mains under the highways. What was really wanted was, as had been pointed out, co-ordination and a bond of sympathy between the engineer to the authority responsible for the highways and the engineer to the utility undertaking who had the right to break-up the highway. ["Hear, hear."] With goodwill and an appreciation of one another's position, he would not despair of a working arrangement being arrived at, and regulations being framed, which should be applicable to the whole country. They had got to face facts as they were. They must make the best of an imperfect world; and if they assisted towards bringing both sides together, the papers would have served an excellent purpose. He understood that a small Committee were sitting on this matter now, and would shortly present a report, which it was hoped would result in some useful uniform regulations.

Mr. WILLIAM TERREY (Sheffield) seconded the vote of thanks, and remarked that they had to recognize that no one public service could claim preponderance in the exercise of rights. They were all working in the public interest; but what they had to do, in view of modern conditions, was to bring about closer co-ordination between the different departments. With regard to newer roads, it was very largely in the hands of the surveyor to provide either wider footpaths to accommodate the services, or verges where all mains could be laid outside the carriageway.

USE OF TAR IN THE CONSTRUCTION OF ROADWAYS.

By THOMAS GLOVER, C.B.E., M.Inst.C.E., of Norwich, and ARTHUR E. COLLINS, M.Inst.C.E., of Colchester.

This is offered on behalf of the Institution of Gas Engineers, whose members are responsible for producing a large proportion of the raw material from which the prepared tar for road dressing and road crust construction is derived. A symposium published in the "Sanitary Record and Municipal Engineering" in 1915, on the subject of "Tarred Granite Macadam—Is it a Failure?" elicited some valuable information from experienced road engineers; and it was clearly shown that tarred granite macadam was by no means a failure where the tar employed was of the right adhesive quality as applied to the stone, and was laid under right conditions.

If the question be fairly considered, we venture to say the overwhelming conclusion will be that tarred road surfaces are a success. The practice of dressing roads with suitably prepared tar (followed by the application of stone chippings in sufficient quantity to form a compact wearing layer) has resulted in the abolition of dust on the highways; and it has, until recently, been the only means available to the road engineer for keeping the majority of road surfaces in a usable condition. Tar dressing of road surfaces has been practised in England for over half-a-century.

OILED ROADS IN AMERICA.

The practice of dressing road surfaces on a large scale with oil and tar has been traced to about the year 1896, when non-volatile oils were used in the drier regions of the United States for spraying the ballast of railways. The practice was first suggested by the clean working of oil-sodden railway tracks in and about the oil regions. The consumption of oil was put at 2000 gallons per mile of single track for the first application, and a lighter dose occasionally afterwards to keep the ballast in good order.

The benefits derived in railway travelling by this practice suggested the use of oil of the same quality, for preventing dust, in place of watering, on the highways of California, where the condition of roads was becoming deplorable, owing to the increasing motor traffic. The first application of oil to the main roads of Los Angeles County for the purpose of laying the dust was made in the summer of 1898. It was soon found that the well-oiled roads were dustless, and that oil, unlike water, helped to mend a road surface, and remained part of it; while water soaked in or ran away, or made mud, which stuck to the wheels of vehicles. The oil was sprinkled at a high temperature; and three applications were made the first year, two applications the second year, and one the third year. It was reported that the dust of the road surface and the oil made a kind of asphalt.

The experiments of the Californian road engineers were soon followed by road engineers in this country; but, unlike America, we had no readily available supplies of non-volatile petroleum oils.

TARRED ROADS.

Fortunately we had oils produced from coal, associated with the resinous portions of the coal which result from its distillation in retorts and coking chambers. These oils, locally produced at convenient centres all over the country in the form of tar, were brought into use in the first place entirely for the abolition of the dust nuisance in the early part of the nineteen hundreds.

In seeking to allay dust by the use of tar, the penetrating quality of the oils in the tar had a distinct attraction for the road engineer, who was then dealing almost entirely with water-bound roads. The adhesive resinous part of the tar, however, was found to have considerable protective qualities in preventing the attrition of the aggregate forming the road crust; and a demand soon arose for a quality of tar having a higher percentage of the adhesive resins and a lower percentage of the volatile parts of the tar, which was found to be of great value as a binding agent for surface dressing and in the tarring of aggregates for tarmacadam work.

Local supplies of tar had advantages to engineers of urban communities; and the gas-works which exist in every town of any size in England, Wales, and Scotland were called upon either to put in distilling plants or get the tar treated otherwise for the removal of highly volatile naphthas and oils. Where the process has been carried out with care to comply with the Specifications which were afterwards forthcoming from the Road Board—see "General Directions and Specifications relating to the Tar Treatment of Roads," issued by the Ministry of Transport (Roads Department), printed and published by H.M. Stationery Office, price 1s.—the results have been, with few exceptions, highly satisfactory. An investigation into the causes of these exceptions would have revealed the reasons for imperfect results—viz., the use of tar of inferior or irregular quality, faulty aggregates, incorrect manufacturing conditions, and incorrect application of the materials, whether in the form of tarmacadam or surface tarring.

In surface tarring the preparatory work, combined with the application of the tar and top dressing material, is very important. It is essential that any irregularities in the road surface be made good, and that the road should be thoroughly brushed and cleaned and in a dry condition before the application of the tar. The selection of the tar, which should comply with the Roads Department Specification for Tar No. 1 or No. 2, should aim at the provision of a tar which has the necessary properties to enable it to adhere thoroughly to the road surface, forming a protective film against external influences. General practice has shown that, when a tar of suitable properties has been chosen, and its application made to the road at proper temperature (largely determined by the characteristics of the tar), the whole being covered with suitable stone or iron slag chippings in sufficient quantity to form a compact wearing layer, and rolled in, the result will be a non-skid surface (which will not adhere to the wheels of vehicles) forming a protective covering that adds materially to the life of the road.

Prejudice has been raised against coal tar on the ground that washings from roads made or surfaced with it injure fish and aquatic vegetation. It is possible that in some special instances this may be true; but on the vast majority of our roads such is not the case, and no sufficient reason exists for excluding tar therefrom.

RIVER POLLUTION.

In this connection, it is interesting to refer to the recent memorandum issued by the River Pollution Committee of the

Ministry of Agriculture and Fisheries, which states "that the impression prevails in many quarters that the Committee are antagonistic to the use of tar in the preparation of road surfaces; they are anxious to correct this impression. The Committee, while desirous that suitable bitumen shall be used on roads in proximity to streams, which obviously are only a small percentage of the whole of the roads of the country, point out that it is no part of the Committee's policy either to advocate the general use of bitumen or to deprecate the use of tar."

Broken iron, slag, or stone roads laid as tarmacadam are probably the most economical surfaces for modern traffic. Successful construction in these materials demands the selection of suitable tar and dry aggregate, and heating the tar to the desired temperature.

METHODS OF CONSTRUCTION.

The aggregate should not be graded, but must consist of all sizes, from the largest to the smallest intended to be used, in correct proportions, to give the densest mixture. Upon a good foundation a coating of tarmacadam 4 in. thick rolled down to 3 in. is sufficient; and the writers have never found it advantageous to lay thicker coatings. Except where it is feared mud will work-up into the wearing coat during construction, the writers have found no advantage in two-coat work; but, on the other hand, the 3 in. finished thickness in one coat is more easily laid, and has been known to give better results, than two-coat work. Many road engineers prefer two-coat work and obtain equally satisfactory results. To govern the thickness of the wearing coat by the condition of the foundation is not good engineering, as it is not economical. A good foundation must be secured before laying the wearing coat.

Suitable stone should be tough, so as to resist the shocks from the traffic. It should have a good resistance to the wear caused by the grinding action of wheels, and should break with a rough angular fracture. The selection of tar which complies with the Roads Department Specification for Tar No. 2 should be based on securing the maximum amount of adhesive and setting properties, in line with the nature of the aggregate to be used, and the conditions under which the tarmacadam is manufactured. Climatic conditions, too, must be taken into consideration; and it should not be difficult to adopt a summer and winter specification for the tar used in the manufacture of tarmacadam, and its application for the respective seasons. Such specifications would also take into consideration, to achieve the best results, the heat values of the stone and tar in the manufacturing operation, and the important factor as to whether the material is for laying immediately or not for some considerable time after its manufacture. An intelligent anticipation of these factors, easily determined by practical experiment, might also take into consideration a better gradation of the stone to secure a smaller percentage of voids than that of present practice, thereby producing a denser wearing course.

The application of the tarred aggregate to the road should be made on an approved, well-drained foundation, with all ruts and depressions made-up and levelled-off by rolling. Each course of material should be laid to the desired thickness and separately rolled before the next course is laid. The consolidation of the material is best done by a roller at least 10 tons in weight. Careful rolling is very important, in order to obtain a good shape to the road, and is generally carried out by commencing at one edge of the road and progressing to the centre; the roller travelling parallel with the centre line of the road. After reaching the middle of the road, the roller should change-over to the other side, and the rolling be performed in a similar manner towards the centre. It is found advisable in most cases to apply a sealing coat of tar to the surface of the road, with a light dressing of stone chippings, sufficiently rolled to bed the dressing in the seal coat. With good materials and workmanship, strictly speaking this should not be necessary; but it is of value where any doubt exists regarding the work.

Approved practice in the construction of tarmacadam roads is responsible for a non-skid surface, combined with lasting and durable wearing properties to withstand the heaviest possible traffic.

GROUTING.

For grouting or penetration macadam, any of the kinds of stone that are used for the ordinary macadam are suitable; and this stone in pre-determined sizes is laid on a substantial and unyielding foundation to a desired thickness, and dry-rolled. The selection of a highly viscous tar with maximum adhesive and setting properties is essential; and its application must be made to the rolled stone at a temperature between 250° and 300° Fahr., either by hand or pressure. The road is then immediately covered with a dusting of ⅜-in. screenings, and well rolled with at least a 15-ton roller. Methods of construction vary slightly, depending upon the size and character of the stone used; and it is important to have the foundation true to shape to get the best results.

Good results are obtained from year to year in many towns with tar supplied direct from the gas-works, which has simply been dehydrated in a simple form of plant. The local surveyor or road engineer knows the tar and binding material available, and adapts his methods of application, frequently with highly satisfactory results. For large-scale operations road engineers will draw their supplies from distilleries dealing with large quantities in well-devised plant. Such distillers have technical and scientific staffs, who keep the process of preparation under supervision to ensure careful standardization. This is a matter of first importance where the results in use are closely observed and criticized by the public using the roads.

The specifications issued by the Road Board have been of much assistance; and a general adherence to the recommendations and suggestions contained therein is of much value in controlling supplies. The owners of proprietary articles have done much good work by standardizing their specialities and by properly organizing their business to do real service. One large firm of distillers make regularly to seventeen different specifications.

At the present time there appears to be a tendency on the part of the authorities to favour imported tars from other sources than coal. These petroleum pitches are applied at a temperature of 300° Fahr. and over, and have little penetrating power. Hence they cannot be used with advantage on water-bound surfaces; but they leave a thicker coating than ordinary Road Board Specification No. 2 tar. Similar preparations to oil pitches can be made in coal tar distilleries. It is important that this should be recognized, as coal tar is made from home-produced material, and finds employment for British workmen.

Hitherto great quantities of pitch and oils derived from tar have been exported for the making of patent fuel and the preservation of timber. It will probably be agreed that a better use for the pitch can be found in road making and road maintenance. Another point to be noted is that any financial benefit derived from the more advantageous sales of gas-works bye-products is ultimately returned to the community. Whether these benefits are better realized by selling tar direct from the gas-works for road purposes or through a large distiller on a profit-sharing basis, is a question to be settled by individual gas engineers. The chief concern should be good reliable results in use, coupled with a satisfactory return for an important bye-product.

The roads of England are the envy of Americans and other people who have not the privilege to live in this country; and it has been observed that when Americans wish to describe a good road, they say "equal to yours in England." During a recent visit to Canada and the States it was found that tar was being used on a large scale; and the term "oiling the roads" is still used as applied to tar surfacing.

The Institution of Gas Engineers and the tar distillers, working in conjunction with gas undertakings and road authorities, confidently anticipate sympathetic co-operation, and hope to be of continued and increasing service in the maintenance of the high character of British roads by the supply of those tar preparations found to be most satisfactory in application and use.

Sir HENRY P. MAYBURY, K.C.M.G., C.B., who presided, in introducing the authors, said Mr. Thomas Glover, in addition to being a distinguished gas engineer, was a very old friend of his. Many years ago, they served together on the Committee of the Midland Association of Gas Engineers and Managers; and ever since those days it had been his pleasure to claim Mr. Glover among his friends. He had also peculiar pleasure in introducing him to the meeting as the Lord Mayor of Norwich.

Mr. THOMAS GLOVER remarked that he was delighted to be numbered among Sir Henry Maybury's friends; and he always looked back with pleasure to the time when they served together in the Midlands. The paper he was presenting had been prepared at short notice during the holiday season, and was therefore not so full as might otherwise have been the case. He then outlined the scope of the paper.

Mr. ARTHUR COLLINS also made some introductory remarks, in which he pointed out the enormous benefits that had been derived from the use of tar on the roads during the war period. Had it not been for this, the roads would have suffered far more than was actually the case. With regard to standards of tar, he feared that many of them as road engineers had been more concerned with the price at which they could buy tar than with the quality of it. If they recommended authorities to give fair prices for what they got, they would be rendering better service than by recommending them to purchase the cheapest, without reference to quality.

Discussion.

Mr. ELFORD (Wandsworth), moving a vote of thanks to the authors of the paper, said that more years ago than he cared to remember he was one of Mr. Collins's assistants, and as a young man gained great benefit from his association with him. Road engineers generally had appreciated the value of tar; and he thought no one would contradict him when he said that but for tar the wonderful development of motor transport which had been witnessed could not have taken place. ["Hear, hear."] It seemed to him that tar was almost as important as the pneumatic tyre and the light internal combustion engine, which brought into being the motor car; but they, as road engineers, also knew that tar had its limitations, and it was rather a pity that this fact had not been frankly recognized in the paper. They found "their heads going

round" with the intensive propaganda with which they were bombarded from all directions. He had been surprised to read some of the statements made in the paper, and particularly the following: "Approved practice in the construction of tar macadam roads is responsible for a non-skid surface, combined with lasting and durable wearing properties to withstand the heaviest possible traffic." He would suggest that anyone who thought this should ask any experienced firm of tar macadam manufacturers whether they would be prepared to lay a tar macadam road and to guarantee it for anything like a period of years for the heaviest possible traffic. Tar macadam was most useful in its proper place; but he did not think anything was gained by over-stating the case, and they should deal with these matters with a proper sense of perspective. There was also in the paper a statement that "similar preparations to oil pitches can be made in coal tar distilleries." He had not heard of them. It seemed to him that there was, as had been remarked by Mr. Glover in introducing the paper, room for both materials, and both were necessary. This was, to his mind, shown by the fact that in many cases tar and bitumen were mixed, and the resultant material was for some purposes very much better than tar alone. There were bituminous materials now—both those that were applied hot and those that were applied cold—which did give very satisfactory results for dressing of road surfaces; and if he might venture to make a suggestion to those interested in the coal tar industry, it was that they should put their energies into the laboratory, and produce materials which possessed the good characteristics of bituminous materials. He was quite sure that if they had the right material to take the place of bitumen, there was not a road engineer in this country who would not prefer to use British material rather than anything which came from abroad. ["Hear, hear."] They might claim, however, that they had got beyond the stage when to cry "British tar for British roads" was sufficient. They had behind them much experience, and in front of them many difficult problems; and they were out to get the best material for the particular use for which it was required.

Alderman F. W. FITT (Norwich) said he felt it a duty, as Chairman of the most important Committee of the City of Norwich—the Executive Committee—to second this vote of thanks. The authors had done what the last speaker had suggested should be done—they had combined together for many years in research. If the same mutual desire to co-operate existed everywhere as had so long been in evidence among the officials in Norwich, no doubt better results would have been seen from tar than they had to-day. In Norwich they were getting very excellent results, and were most anxious to use tar for certain purposes. At the same time, there was room for both materials.

The CHAIRMAN said he, too, would like to emphasize the point made already, that there was plenty of room for both tar and bitumen, and other materials, in connection with the road improvement of this country. Mr. Collins had referred to the time during the war when, had it not been for the supplies of tar, roads would have sustained much more damage than they actually did. It was no use, and there was no object to be gained by, dealing in recrimination; but he would remind those present that had it not been for the suicidal policy of the gas companies after the war, probably bitumen would not have made the strides that it had. He remembered having an important deputation from the tar interests asking him to issue a circular-letter to the local authorities of the country telling them that they should not use tar upon the highways, but should get anything else, because they wanted all the tar that they made for the purposes of briquetting material. Prices in those days were pretty high. Let them carry their minds back to 1921. They lost the market somewhat. His sympathies were with tar; for he was an old gas engineer, among other things. When he had charge of gas-works, he was selling tar at ¾d. a gallon. His friend now was not happy unless he could get 5d. or 6d.; and there was a time in 1921 when one could not get it for 1s. a gallon.

Mr. SAMUEL GLOVER (from the audience): Yours was raw tar.

The CHAIRMAN: A good deal of what we have had lately has been raw tar.

Mr. SAMUEL GLOVER: To speak of "tar" is not sufficient when referring to the price. Road tar has to be prepared from raw tar.

The CHAIRMAN: This paper deals with the Road Board Specification for Tar, with the preparation of which I had something to do; and I think it will be conceded to me, in this audience, that at any rate I know something of what I am talking about.

Mr. THOMAS GLOVER expressed his gratitude for the reception accorded the paper, which he hoped would prove useful.

Mr. COLLINS, referring to the sentence in the paper to which Mr. Elford had taken exception, said that "heaviest possible traffic" was perhaps rather a stronger expression than was necessary. They were not considering such traffic as was met with in (say) Glasgow or Sheffield, but the heaviest traffic on country or suburban roads. He did not think it would be argued that tar macadam would take the place of wood paving, for instance. Neither Mr. Glover nor himself wanted to make out that tar was the only thing for road making; they must choose their materials in accordance with the circumstances they had to meet. There were plenty of cases in which bitumen was the more suitable; but their contention was that the vast majority of roads in this country were better treated with tar than with anything else.

The CHAIRMAN added that what they must aim at was to get the greatest possible friction between the material on the surface of the road and the wheels of the vehicle.

INSTITUTION OF GAS ENGINEERS' CONFERENCE

AT THE PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS AND EXHIBITION.

IN connection with the 1925 Public Works, Roads, and Transport Congress and Exhibition, at the Royal Agricultural Hall, Islington, there was a full programme of debates; and the session last Wednesday morning, in the Shepherd's Room, was arranged by the Institution of Gas Engineers. Mr. C. F. BOTLEY (the President) was in the chair; and there was a large audience to hear and discuss the two papers presented, the authors of which were Mr. C. S. Shapley, of Leeds, and Mr. George Evetts, of London, who dealt respectively with the questions of public lighting and valuation. The main portions of these papers are given below.

The CHAIRMAN, after welcoming those present, called upon Mr. Shapley to introduce his paper.

Mr. SHAPLEY remarked that, not knowing whether or not his audience would be technical, he had found some difficulty in determining the lines his paper should take. He had decided upon a popular type of paper, and hoped he had been right. Again, as President of the Institution of Public Lighting Engineers, he was forced to retain an absolutely impartial mind regarding gas and electricity—both had their virtues. As a member of the Council of the Institution of Gas Engineers, however, he had been asked to give a paper strictly from the gas standpoint, and not on behalf of the Institution of Public Lighting Engineers. There was, of course, much to be said about street lighting, which played so important a part in life to-day.

He then went over the points of his paper, which he illustrated by a number of lantern slides that showed controller mechanism and views of street lighting in Leeds. Controllers were also fitted up in the room for inspection.

PUBLIC LIGHTING BY GAS, WITH SPECIAL REFERENCE TO AUTOMATIC SYSTEMS.

By CHARLES S. SHAPLEY, Engineer and General Manager, Gas Department of the Leeds Corporation.

Public lighting, in my opinion, is a service of the first importance. It serves the community generally, whether it be the pedestrian, the motorist, the drayman, or the policeman. Good public lighting is a safeguard both to the individual and to property, as it is an insurance against crime. Adequate lighting gives wonderful confidence to the more nervous of the community; and in my capacity as the Lighting Engineer of Leeds, I have received hundreds of letters asking for additional lighting, and many letters of thanks from ratepayers who are now able to use the streets with safety, which proves beyond question how much the general public appreciate good street lighting.

The business interests in our cities are fully alive to good lighting. Take the West End of London, the shopping centres of our large cities, or any progressive trader, and observe that good lighting is made one of the principal attractions to draw the crowd. It compels attention, which is the first law of advertisement; and whether it be a stores or a town, both gain by good lighting. You rarely find the sea front of a progressive seaside town badly lighted; the reason is obvious. You will notice in your own towns that the crowds are found in the best-lighted streets, and the lesser-lighted thoroughfares are avoided. Of course, the lighting of the busy centres is far in excess of what is required for safety. In fact, some effort is made to attract; and the extra illumination provided by some lighting departments is justified by the beneficial influence it has on the business returns of the ratepayers of the district, and also as a means of reducing street accidents. As we leave the centre of the city for the suburbs, the street lighting cannot be expected to be maintained on the same scale prevailing in the centre, for very obvious economic reasons. Nevertheless, the grading of the illumination from the centre to the outskirts usually leaves much to be desired, as in many cases there is too great a contrast.

Contrast and patchiness in street lighting are undesirable, and must be avoided. The kerb must always be well illuminated, so that road users can see anyone stepping on to the road. The safety of the pedestrian is the primary object of street lighting; and illumination should be such as to throw into relief objects on the road. This would be of considerable help to the motorist, and would render the use of headlights unnecessary. As a motorist since 1908, I am surprised a law has not been passed altering the rule of the pavement so that

pedestrians on the kerb edge would be facing the oncoming traffic. I am confident that this would go far to avoid many fatalities in the course of a year.

SUBURBAN LIGHTING.

In the suburbs, not considering main roads, the usual spacing of lamps and the candle power are, in the majority of cases, inadequate to maintain a minimum of 0·01 foot-candle ground illumination between lamps, which is lower than Trotter's minimum in his classification of street illumination.* This opens the question of what can be considered adequate suburban lighting; and opinions are varied on this point. Illumination is like culture. As we progress we demand more; and it is difficult, if not impossible, to set a standard acceptable to all. Nevertheless, I think you will agree that the two chief essentials are that it should be sufficient to make night travel easy and provide a sense of security and minimize that dread of using the roads after dark which some—more especially our women folk—experience. I find that the sense of security appears to vary directly with the intensity of the lighting.

At the recent conference of Public Lighting Engineers, held in Leeds, a number of speakers stated that, in many large and medium sized towns, the street lighting is not given the thought and expert consideration it deserves, having regard to the great public service it renders. There are throughout the country many lighting departments which are under the control of people who are unfortunately not *au fait* with an elementary knowledge of illuminating engineering; and, of course, under these conditions it is impossible to get, or even expect, efficient service. Large and medium sized towns should be in a position to pay for the services of a competent man; and the smaller towns could employ an expert, in a consultative capacity, as required. This, I feel confident, would greatly improve the lighting of the smaller places, and would not necessarily mean any appreciable increase in the cost of the service.

I am not unmindful that the energies of some lighting officials are very much curtailed, and in some cases any progress is difficult, due to the fact that the lighting authority does not realize the supreme importance of good lighting. In their anxiety to keep the rates at a low figure, they are not willing to find the necessary funds; consequently the lighting suffers. Good lighting costs money; but since the introduction of improved lighting in Leeds the police force has been reduced, and this has been made possible through a progressive Finance Committee having granted the necessary lighting rate. There is still work to be done in determining the standard of light for classified roads; and the Institution of Public Lighting Engineers are considering this matter.

While on the subject of finance, I contend that the feeling of security and peace of mind brought to the citizens of a well-lighted town cannot be valued in terms of money. I am pleased to find there is a growing demand for more efficient lighting throughout the kingdom; and since the formation of the Institution of Public Lighting Engineers, I have noticed a considerable improvement in the lighting of many towns. I sincerely hope that those of my listeners who are connected with or interested in public lighting will see to it that their lighting official, if he is not already a member of the Institution, will become one, as he will derive great benefit from attending its meetings.

To attempt to review the problems of street lighting in its varied aspects would provide sufficient material for many papers, and would necessarily have to embrace systems of luminous energy other than gas; but, as this is the session of the Institution of Gas Engineers, I must limit my remarks to gas.

GAS LIGHTING.

It would probably be of interest briefly to outline the history of gas lighting from the time when London was first lighted by flat-flame burners, which, when introduced, were so far in advance of previous systems of lighting as to create a great sensation. Improvements were brought about in the construction of the burner (the Argand being the most noteworthy), and also in the types of lanterns used. The next great advance came with the introduction of the upright incandescent burner in 1887, with its greatly increased candle power. This marked the beginning of a general progressive change-over from flat-flame to incandescent burners for public lighting. The upright gas mantle was very fragile and liable to fracture. To eliminate this, anti-vibrators were introduced. These, however, were never very satisfactory. The introduction of the inverted burner in 1903, in my opinion, did much to eliminate mantle breakage. This burner opened-out a new field for the design of street lamps, enabling more light to be usefully employed by allowing a greater use of the reflector, which is a most important feature of present-day lamps, so that to-day the efficiency from a public lighting standpoint, due to the introduction of the burner and the reflector, has been greatly enhanced.

Quite recently great progress has been made in low-pressure gas lighting by the introduction of low-pressure high-power lamps, with their superheater burners and mantles in clusters. The best results in public lighting, everything taken into consideration, are being obtained from this system of lighting. There are many sizes of inverted mantles. The smaller are stronger; and renewals due to breakages are less frequent than with the larger type. These smaller mantles are giving from 60 to 80 candle power. Lamps fitted with this type of burner, suitable for lighting side streets or for busy centres of traffic, should as far as possible rapidly displace older types of lamps fitted with large mantles. Lamps up to 2000 candle power with cluster burners are now on the market, and are suitable for adequately lighting important thoroughfares.

The particularly diffusive nature of gas lighting is generally acknowledged to make it very suitable for street lighting; and this characteristic gives it a distinct advantage in foggy weather, as its light is very penetrating. There are innumerable types of lamps on the market, suitable for all phases of street lighting; but in the time at my disposal it would be impossible to attempt to describe them.

To get the best value out of any service it is necessary to make full use of the available energy without waste; and it was apparent, even in the earliest days of street lighting, that there was a tremendous waste of luminous energy, owing to the time taken by the lamplighter between lighting the first and last lamps on his beat. It was necessary under this system to light the majority of lamps during daylight; and a similar waste occurred in extinguishing. It was obvious that this waste of money and energy, if checked, could be used to lessen the cost of street lighting to the ratepayer; or, on other hand, for the same expenditure better service could be given. In order to obtain the greatest economy, it is necessary that the lighting be varied between the hours of evening and dawn—that is, give the maximum illumination during the early hours of the evening, when it is most needed, and curtail it to a minimum in the small hours of the morning, increasing it again when necessary to meet special cases, such as foggy weather, or during the dark mornings for people going to work. This in the old days meant the lamplighter being at call practically any time during the twenty-four hours; and what may have been a possibility then would now, with improved and more favourable working conditions, amount to a practical impossibility, even if it were desirable.

CONTROLLERS.

It followed that the introduction of some kind of control was the inevitable order of progress; and we find that what are now known as automatic controllers were mentioned so far back as June 20, 1868, in a journal called "Once a Week":

> What has the poor lamplighter done that he is threatened with banishment from our highways and byeways? Surely, of all public servants, he is one of the most active and exemplary. . . . Yet it is designed to exterminate him, and to supersede his office by a clockwork attachment to the taps of our street lamps, which will turn them on at stated times every night, and shut them off every morning; the gas being kept constantly burning during the day with a small blue flame duly protected against extinction by the wind. The inventor of the plan is a Norwich surgeon, Dr. Thurger. . . . It was discussed at a recent meeting of the Royal Society of Arts . . . and the advantages of some sort of automatic lamplighter were fully admitted.

With the introduction of incandescent burners, the automatic control which was then used for flat-flame burners was found unsuitable for the newer type of lighting, owing to the slow movement of the clock by the clockwork mechanism. During the period of "off" to "full on" the gas and air mixture varied progressively through the explosive stage, causing the burner in many instances to light-back. It was obvious that quicker lighting was necessary to make clockwork controllers successful; and a device for this purpose was introduced at the beginning of this century. The numerous automatic controllers of different types and makes which are now on the market have reached a very high standard of efficiency. This has provided gas with facilities of control which were once thought to be the prerogative of electric light; and consequently gas, with its more diffusive light, has made itself a most attractive proposition for lighting schemes of all descriptions.

The best-known systems of automatic control for lighting and extinguishing are clockwork and pressure wave.

CLOCK CONTROLLERS.

The present clock controller can be classed as "fool-proof." Its range of usefulness is wide, being suitable for all schemes of lighting. It has advantages over the pressure-wave system of control, inasmuch as certain parts of the lighter's beat can be divided; some streets can be clock controlled, and others hand lit. I have adopted this in many cases, and have saved labour in patrolling side streets during lighting time; while the time of lighting and extinguishing can be varied to suit local conditions. It is also possible to-day to obtain a clock with two gas outlets, which can operate any pre-determined number of mantles on a cluster head. For instance, it would light up all mantles at dusk, and extinguish any desired number at midnight, and the remainder at dawn. Another point in favour of clock controllers over the pressure wave is that, being independent units, faults develop singly; whereas with pressure-wave controllers a whole district would be affected by a failure in the operation of the "wave."

The action of the controller is wholly independent of the gas supply; and fluctuations of pressure and supply do not interfere

*See "JOURNAL," Vol. 122, p. 250.

with its working. On the other hand, the readily acknowledged difficulty of synchronizing hundreds of clocks can be well appreciated; and it follows that some differences in the times of lighting between one lamp and another are inevitable. As regards the financial aspect of this, the lamps lit before and after the specified time practically cancel-out each other, so that there is little or no loss; and as far as my personal experience is concerned, the timekeeping of modern clock controllers, generally speaking, is exceedingly good.

We are proceeding in Leeds to clock all main arterial roads, in order to derive full advantage from the automatic control system by having all our main roads illuminated before dusk. At the present time we have over 5000 controllers at work. One man attends to 160 lamps on clock-controlled districts, and only one clock repairer is employed for the whole system. The cycle of operations in clock controllers makes them operative at pre-determined times; and consequently, should a spell of fog or darkness set in during the non-lighting period, each individual lamp would have to be lighted by hand, if illumination was required. The danger of dust and insects getting into the mechanism was another trouble with many clock controllers; but to-day there are controllers on the market in which clock and valve are totally enclosed, which eliminates this fault.

PRESSURE-WAVE CONTROLLERS.

An ideal in street lighting is to be able to control the whole operation of lighting from one centre; and this probably was the incentive which encouraged an enormous amount of experimental work, from which was evolved the pressure-wave controller. It will be necessary for anyone considering the installation of pressure-wave control to ascertain first of all from the distribution department of the gas-works how far on the district the desired pressure wave would operate. For successful working, it is necessary that the pressure wave should reach the wave mechanism; and to make this possible it is absolutely essential that the gas supply mains should be of adequate size, and the services and fittings free from any obstructions. In some towns the wave could be made to operate throughout the whole distribution system. In Leeds, it is put on from one source, and only operates in one portion of the distribution system; consequently, we have to limit our wave controllers to this area. The idea of lighting and extinguishing lamps at will by pressure wave from the distribution centre is very fascinating, and solves the problem of dealing with sudden changes in our weather conditions—such as fogs—when it is necessary that illumination should be provided at a moment's notice.

The greatest asset of the pressure-wave controller is bulk operation by central control. Additionally, in the usual type of pressure-wave controller there is no clock to be kept in order and synchronized. In Leeds over 3000 pressure-wave controllers are in use; the majority being Alder & Mackay automatic controllers, and the remainder Broadberry or "Telephos." We have had the utmost satisfaction from both types, and only one man is employed to attend to all failures; while the lamplighter attends to 160 lamps, as against 100 hand lighted.

I have endeavoured in the foregoing to lead you up to the advantages of automatic control, whether by pressure wave or clock controller; and in order to make the paper of practical use, I have included an appendix describing the three controllers I have had the most experience with in our own district.

In doing so, I want it to be clearly understood that I do not in any way detract from the advantages of other controllers not mentioned in this paper. As previously stated, the modern controller is a very efficient piece of apparatus, and one to be thoroughly relied upon.

APPENDIX.

[The illustrations and explanation of the lettering appearing with the paper are omitted.]

BROADBERRY PRESSURE-WAVE CONTROLLER.

The instrument is made up in two main parts, which are separate:

1.—The valve box, in which is the mechanism which receives any fluctuations in the gas pressure, and differentiates between gradual increases in pressure and intentional increases in pressure intended to operate the necessary mechanism for lighting or extinguishing the lamp.

2.—The operating box, which contains the mechanism for opening and shutting the gas valve controlling the gas supply to the burner and the by-pass.

When the increase in gas pressure intended to light or extinguish the street lamps is put on at the gas-works, the relatively sharp increase actuates the ingenious mechanical arrangement in the valve box, and allows a supply of gas under pressure to go forward through a small service pipe to the operating box. There it lifts a leather diaphragm, to which is attached a spindle carrying a pawl, which engages in the ratchet wheel fixed to the gas cock, opening or closing it, depending upon the stage in the cycle of operations. After the pressure wave has operated, the mechanism of the valve box shuts off the gas supply to the operating box, and the leather diaphragm drops to its original position, and is again ready to operate when the next pressure wave is put on.

"A. & M." PRESSURE-WAVE CONTROLLER.

The Alder & Mackay controller is exceedingly simple, both in design and operation. The lighting and extinguishing of the gas lamps is by a pressure wave which lifts an inverted bell, to the crown of which is attached a stirrup arrangement, which engages a flat perforated stepped disc, and causes it to rotate partially on a perforated seating covering the gas way. This brings either hole in the disc in alignment with the aperture in the seating, and so allows gas to pass from the bell chamber to the burner, or a solid face which shuts off the gas way. When the pressure wave is taken off, the bell drops, and the stirrup falls into position under another ratchet tooth of the stepped wheel ready for the next operation.

On a district where it is proposed to light all lamps, extinguish some at midnight and the rest at the usual extinguishing times, the disc necessary for midnight extinguishing contains three circular holes equally spaced, and for the lamps intended for all-night service the perforations will be slots covering an arc of 80° equally spaced. By a suitable arrangement the by-pass is cut off immediately after the burner is lighted, and is brought into operation again by the movement of the disc which cuts off the supply to the burner.

"DUPLEX" CONTROLLER.

Clockwork is the motive power which operates this appliance. The apparatus operates through two tappets set at predetermined times on a dial, actuating a rocking arm which is in communication by suitable means with a gas valve. The engagement of the tappets with the rocking arm opens and shuts off the gas to the burner, at the same time opening and shutting the by-pass intermittently with the burner supply. The gas valve can be hand operated without interfering with the clock or setting. The valve is of the shuttle type, and is totally enclosed. By a suitable modification of the gas valve, this apparatus is adaptable for groups of cluster burners, where it is intended to have "all" or "partial" lighting during specified hours.

Discussion.

The CHAIRMAN said Mr. Broadberry, who had had a great deal of experience with automatic lighting, was unfortunately unable to be present; but he had kindly sent on a contribution to the discussion.

The SECRETARY (Mr. Walter Dunn) then read the following

COMMENTS BY MR. A. E. BROADBERRY.

I am sorry that I am unable to be present to-day to join in the discussion of Mr. Shapley's paper, particularly as he has been good enough to make reference to the apparatus which bears my name, but which has now no more to do with me than with anybody else in particular. Mr. Shapley has such a complete grasp of his subject that no criticism is possible. As a contribution to the discussion, if I state the reasons which led to the production of what Mr. Shapley kindly calls the Broadberry controller, it may perhaps be of some interest. For many years I felt pity for the lamplighter who was compelled to face all sorts of weather in order to do his job without fail every night and every morning at a given time. I remember a series of articles appearing in a magazine "Men who Face Death," and the lamplighter was included.

Automatic lighters seemed to be the only things which could bring relief in this often unpleasant duty. The saving in gas alone would repay the cost, because with hand lighting a man must start his round before sun-down to finish one hour after sunset. It seems folly that a man should light public lamps when the sun is shining. The same waste takes place in the morning, as extinguishing cannot be started before dawn.

Clockwork controllers were introduced, and made headway, notwithstanding what seemed to me to be certain definite disadvantages. Exposed public street lamps subjected to all sorts of violent weather changes did not promise to be a healthy spot for timepieces—they are often trouble enough when carefully nurtured indoors. Then there was the weekly winding to be done. Assuming that they all remained properly synchronized—which is an impossible hope—they all had to be set for a week in advance; and, as is well known, dawn and dusk vary during many months of the year, each of them by a quarter of an hour per week. Therefore the clocks must be set for the darkest day of the week; and so some of the possible saving is lost. Apart, however, from the calendar, darkness varies almost daily according to weather conditions; and clocks cannot take such matters into consideration. At its best, clockwork can only go steadily on its way; and not being variable at will, control by clockwork was really no control at all.

The so-called pressure wave gave variable control direct from the gas-works. Most types of controller were made to operate when a predetermined height of pressure was reached, and they made themselves ready for the next operation when the pressure was lowered to another predetermined point. The desired conditions could not always be relied on, particularly in remote districts or where mains were small, or where, perhaps, large factories worked overtime and the draught on the main affected the pressure. There were various causes for pressure sometimes failing to reach its desired maximum or remain above its minimum till the appointed time. It seemed desirable, therefore, to make an apparatus which would adjust itself to varying conditions of pressure which came about unintentionally and were not intended to operate the control mechanism. This was easily done by the little hole in the accurately-balanced float.

One other essential for successful working, to my mind, was that the full force of gas pressure existing in the mains should be made available for the turning on and off. This is secured by operating a separate valve to admit the full pressure to the diaphragm. This, to my mind, is an advantage over the weighted bell type, in which

only a small differential pressure is available for operating, and may cause hesitation and lighting-back, even if it does not fail altogether. I am greatly obliged to Mr. Shapley for his paper, and I tender him my best thanks.

LAMPS AT THE BACK OF THE PATH.

Mr. OWEN BAINES (Paignton) asked whether the author had considered central lighting by gas. In the town which he (the speaker) represented they had up to now been unable to come across any suitable lamp to be applied to the span wire system. They had recently carried out some street widenings, and endeavoured to improve the lighting in others, and had been obliged to confine themselves to electricity; but, in order to give fair play to both undertakings, he had tried to introduce gas—especially as he found, taking lamp for lamp, and light for light, that, if anything at the moment, gas probably "had it." He did not find any difficulty in getting the kerbs sufficiently visible with the span wire system; in fact at the kerb it was a distinct improvement over the ordinary system of lighting. For one very strong reason, he had removed a certain number of lamps from the kerb and put them at the back of the path. Omnibuses and other vehicles seemed to delight in charging the lamp-posts, and then there was generally trouble between themselves and the insurance companies as to who was liable. Had anyone else had experience of placing lamps at the back of the path in this way? So far his own experience had been satisfactory.

Mr. W. J. LIBERTY remarked that centrally hung gas and electric lamps were quite an old story now. It would be helpful if Mr. Shapley could give some particulars of the saving both in time and money where the clockwork controllers were in use. It would be interesting to know the number of men displaced by a certain number of controllers; the difficulties and successes of the system; and the quantity of gas used through the by-passes.

Mr. ELFORD (Wandsworth) said that some years ago it had been his pleasure to work with Mr. Shapley. Mr. Broadberry stated that with the clockwork controllers the apparatus had to be set every week in advance. This was not altogether a full statement of the facts, because there was a clock controller, of which he himself had used many thousands, which operated the lighting and extinguishing by a cam that was cut so that the variation was made day by day, exactly to the time set for lighting and extinguishing throughout the year. This controller he had found to be satisfactory in every way. It was wound once a week when the lamp was cleaned. Some definite information with regard to cost would be valuable.

SPACING OF LAMPS.

Mr. J. TAYLOR (Weston-super-Mare) asked for information as to the percentage of failures per operation in the case of pressure-wave controllers as compared with clockwork ones; and as to experience in Leeds so far as mantle usage was concerned. The spacing of lamps referred to by Mr. Shapley in connection with one of his photographs had struck him. As gas engineers, 20 yards spacing was perhaps something they would all desire; but he himself had had a good deal of difficulty in getting the Council to agree to 80 yards. As to central lighting, he believed there was a good deal of opinion at the present time in favour of the lamps being along the line of the kerb, whether they were suspended from span wires or whether they were pillar lamps. According to his information, central lighting was not all that could be desired; it frequently threw the footpaths into shadow, especially when there were a number of large motor vehicles about.

Mr. HORTON (Oldham) agreed that anything which could be done to obviate danger, by making pedestrians keep to the left, was a national duty.

Mr. JOHN WILKINSON (Nottingham) said the author stated that one man attended to 160 lamps on clock-controlled districts. Did the one man attend to everything in connection with these lamps, including cleaning and maintenance of mantles and burners?

Mr. WILKIE (Leicester), alluding to controllers, remarked that there could be no doubt that they must, according to the circumstances of the day, adopt some mechanical means. They were living now in a mechanical age. The advantage of the pressure wave over the clock seemed to him to be that on a foggy day they could get instantaneous lighting at any moment. The secret of the clockwork controller was the by-pass; and here he would like to utter a word of warning. The by-pass must be housed in a weather-proof lantern. Otherwise there would be a tremendous amount of trouble through the by-pass blowing out.

Mr. ANGUS (Eccles) gathered that the author of the paper was getting very satisfactory results from clockwork controllers; but unfortunately his own experience had been that they were unreliable—the clocks frequently stopping. He could only assume that Mr. Shapley's were better, or perhaps the controllers were brought in for cleaning more frequently. How often did Mr. Shapley have his brought in?

Mr. PRICE said that in his part of Monmouthshire he found the particular type of pressure-wave controller of which he some years ago had had experience was unsatisfactory, owing to high altitudes. He suggested that, in roads where both gas and electricity were available, if they put one on each side of the street, they would have "two strings to their bow." It appeared to him that 160 lamps was rather a large number for one man to attend to; he should say 120 would be a fair figure.

Mr. READ said that in his part of Wales he had had trouble with controllers, caused almost entirely by the by-pass. Could Mr. Shapley tell them of a satisfactory by-pass for a district of varying altitudes and pressures, and having a stormy climate? If the by-passes were of a reasonable size for mid-day pressure, the flame was 6 in. long at night; and they were very extravagant, and also sooted-up. On the other hand, if they were made of a reasonable size for the evening, they went out at mid-day. Was it possible to have electric ignition, or a flint and steel?

The CHAIRMAN remarked that this paper dealt specifically with public lighting by gas, with special reference to automatic systems; but there were outstanding features connected with gas lighting which should not be overlooked. It was perfectly certain that in most cases, light for light, gas was the cheaper medium; and there was also the great reliability which necessarily resulted from its storage system. Then, of course, there was the striking quality of diffusion enjoyed by gas lighting, which rendered it so valuable in times of fog. These were things that anyone concerned with public lighting must take into consideration. One speaker had put forward the suggestion that, where convenient, electricity might be put on one side of a road, and gas on the other. Personally, he would very much deprecate a mixed system. The reliability of gas supply was a very important feature; and in these days, when they had at hand both gas and electricity, whether they were interested in one or in the other, in the public service they should seek for reliability. He could not understand the tendency to rely upon electricity for very serious purposes, when there was gas available.

THE AUTHOR'S REPLY.

Mr. SHAPLEY said it was pleasing to him to find that his humble effort had aroused a little interest. There was not much for him to answer in Mr. Broadberry's remarks; but he would like to thank him for them. Of course, central lighting could be carried out by gas. All the centre of Leeds was lighted centrally on the span wire system. Much was by electricity; and the remainder was by high-pressure gas. It was perfectly easy to light on this system by either high-pressure or low-pressure gas. He agreed that light for light, gas "had it." The placing of lamps at the back of the path was a course that would not meet his views. Anyone who knocked down a lamp-post in Leeds had to pay the damage. With reference to the statement that one man attended to 160 lamps on clock-controlled districts, he had been asked how this compared with hand-lighted lamps. In Leeds the hand lighting round was 100; while a man could easily do the clock controller round of 160. The men were not overworked. They carried out their duties efficiently; and the lamps would compare with any others for cleanliness. The clocks were set every week, and he did not see that a cam would serve any useful purpose. The weekly adjustment was all that was necessary. Cleaning was done once a week, and oftener if required. There was a keen spirit of competition among the men with regard to the appearance of their lamps. With reference to the percentage of failures, he could only say that their experience in Leeds had been exceptionally good. They had gone to a lot of trouble in selecting a suitable pattern. It was essential that the whole of the mechanism should be protected from the elements, and also from dust. The usage of mantles per nozzle in Leeds was slightly under 6 per annum—5·8, to be exact. He thought all would be agreed that this was a very good figure indeed. In the matter of the spacing of lamps, Leeds was, of course, a little differently situated from Weston-super-Mare. The Leeds Corporation had control of both gas and electric lighting; and the city realized that good lighting cost money. As a matter of fact, as he had stated in his paper, good lighting could not be valued in terms of money. He sympathized with Mr. Taylor in having to make his lighting fit the price. This was wrong; there should be efficient lighting first. Leeds never grumbled at the cost of lighting—though it was equal to an 8d. rate—because they got good service. The clock-controlled lamp man did everything to his lamps except glaze them. He walked the round to see (without necessarily passing each one) that every lamp was alight. He had adopted a by-pass which consumed 1-10th c.ft. an hour, and which was packed with asbestos fibre; and there had never been any trouble from it going out. Whether a clock was lighting and extinguishing or not, it was necessary for the efficiency of the clock to keep it wound all the 52 weeks of the year. This was the secret of accurate working of the clocks. There was a lot of trouble in the early days of clock controllers; but much brainwork had been put into the apparatus by the various makers. The "slow motion" clockwork had done away with difficulties of lighting-back, &c.

The CHAIRMAN remarked that he himself came from a very exposed seaside resort, where there was wind, and also moths. It was essential for good lighting by gas that the lanterns should be windproof. Circumstances might not justify the use of clock controllers in small places. For a small round in a compact district, where the lamps—say, 50 or 60—could be handled in a short time, it was, in his opinion, more economical and more satisfactory to employ torch lighting, with flaps in the bottom of the lanterns. There was no by-pass, and one could keep the lamps always in perfect order. On behalf of those present, he thanked Mr. Shapley for his paper.

Mr. SHAPLEY pointed out that he had not been advocating clock controllers as against hand-lighted lamps. It was no part of the scheme of his paper to deal with the merits of the two systems.

The CHAIRMAN said they were now to consider a paper on a very complicated, but at the same time an intensely interesting, subject—the valuation of gas-works for rating. Those who had perused the paper would have noted that Mr. George Evetts had dealt with the matter in his usual able and precise manner.

Mr. EVETTS, in introducing his paper, pointed out that he was not an expert in rating, and had approached the matter more from the gas engineer's point of view.

VALUATION OF GAS UNDERTAKINGS FOR RATING PURPOSES.

By GEORGE EVETTS, M.Inst.C.E.

HISTORICAL.

In order to establish a uniform method of rating, the Parochial Assessment Act of 1836 was passed, and the principle of rating was laid down in section 1 as follows:

> No rate for the relief of the poor in England and Wales shall be allowed by any Justice or be of any force which shall not be

made upon an estimate of the net annual value of the hereditaments rated thereinto—*i.e.*, of the rent at which same might reasonably be expected to let from year to year, free of all usual tenants' rates and taxes and tithe commutation charge (if any), and deduct therefrom the probable average annual cost of the repairs, insurance, and other expenses (if any) necessary to maintain them in a state to command such rent.

In 1862 a further Act, called the Union Assessment Committee Act, was passed, in order to achieve further uniformity. Section 15 confirms the principle enunciated in section 1 of the 1836 Act in the following words:

> The gross estimated rental for the purpose of the schedule to this Act shall be the rent at which the hereditament might reasonably be expected to let from year to year, free of all usual tenants' rates and taxes and tithe commutation rent charge, if any.

Rating in the Metropolis before 1869 had been under the two Acts mentioned; but in that year the Valuation (Metropolis) Act was passed, and in this Act definitions were given to various terms which were more clear than those in the previous Acts. For instance, the term "hereditament" means any lands, tenements, hereditaments, and property which are liable to any rate or taxes in respect of which the valuation list is by this Act made conclusive. The "gross value" is defined as meaning the annual rent which a tenant might reasonably be expected to pay (taking one year with another) on the assumption that the tenant undertakes to pay all usual tenants' rates and taxes and tithe commutation rent charge (if any), and if the landlord undertook to bear the cost of repairs and other expenses necessary to maintain the hereditament in a state to command that rent. The definition of "rateable value" is as follows:

> The term "rateable value" means the gross value after deducting therefrom the probable annual average cost of the repairs, insurance, and other expenses aforesaid.

The Act of 1862 still serves for the Provinces. The Union Assessment Committee Amendment Act of 1864 gave the right of objection at any time during the currency of the rate, and objection before the Assessment Committee was made a condition precedent to an appeal to Quarter Sessions. Theoretically the rateable value is settled every year, but practically one assessment stands for a number of years. In the Metropolis a new rating list is got out every five years, the "quinquennial" dating from April 6, 1871.

Thus in the early history of rating the revenue was required for poor relief; and this still represents a substantial proportion of the total rates levied, approximately 25 to 30 p.ct. The ability to pay is a perfectly sound method of estimating liability for the upkeep of the poor; but when education, police, lighting, sanitation, and road maintenance are included, it is clear that "services and benefits received" should be taken into account in calculating the rating assessment in modern times.

An Equitable Basis of Valuation.

It is obviously impossible to lay down a method of assessment which would satisfy all cases and satisfactorily strike the balance between paying ability and benefits received; for if one could devise a satisfactory formula for the main principle, there would be unlimited variations in cases, and a practical difficulty in assessment. A truly scientific method of assessment is impossible; and there is little doubt that the principle of rental value, with certain deductions and modifications, is as good a compromise as can be found. If it is learned by experience that certain broad classes of ratepayers are being unduly penalized, some method of adjustment can usually be found.

Take, for instance, the vexed question of pre-war as contrasted with post-war values. Mr. "A." may be living in a house valued at £50 per annum gross in 1914, and possibly assessed at £42. With the full 40 p.ct. addition, the new rental value is £70; but it is tacitly assumed that 25 p.ct. of the addition is for extra repair costs, leaving only 15 p.ct. to be added to the net. Therefore the present gross figure of £70 should logically become £49 10s. rateable. Mr. "B." may be a newcomer to a similar house next door, but forced to pay £100 a year for a similar house, or (say) £80 rateable. Why should "B" pay more than "A?" The benefits received are equal, and "B" may be unable to pay as much towards the upkeep of the poor as "A." Equality of rating being aimed at, it is found almost invariably that, despite the discrepancy in rent, the two houses would be assessed at the same figure. At the same time, the assessor has great difficulty in making up his mind whether this value should be based on the lower or the higher rental, and probably a compromise is arrived at.

It would appear, therefore, that the present basis of assessment—*i.e.*, what a tenant would pay to occupy the premises—cannot be improved upon; but the ramifications relating to this apparently simple hypothesis are surprising. For private houses and shops the rental is not difficult to estimate, as there are usually hundreds of similar premises as a guide. Further, there is a continual flow of tenants, as a dwelling house appeals to such a wide circle of the community. As a class of premises alters, so does the difficulty increase in practice. A professional man may make a large income in small premises; but these are only liable for rates on the same scale as a tenant having his professional address in the City or West End. In Harley Street, however, the rents are high because it is an expensive neighbourhood; but in this street no tenants outside the medical profession would pay the rents and corresponding rates. In dealing with a factory, the small owner may rent the premises and provide certain chattels on which he would not be rated, and machinery on which the rate would not be substantial, and the rateable value is still a comparatively simple matter, seeing that the landlord and tenant are two separate individuals, the latter paying rent to the former. The class of trader to whom the premises would appeal, however, is getting somewhat narrower.

The Contractor's Basis.

The next step is the case of a large company or group of people owning a factory or mill—such as a textile factory, steelworks, or shipbuilding yard. The premises may or may not be freehold, although they generally are; and these industrial establishments are usually rated on the "contractor's basis." This method is based on the assumption that the landlord builds the factory—such as operating shops, stores, &c.—and provides wharves, sidings, boundary walls, drains, and facilities for heating, lighting, and machinery for providing the operation of the factory up to the actual process machinery. The rating of process machinery gave rise to much difference of opinion; and it may be stated broadly that the treatment rests on two decisions.

The Hunslet decision in 1906 laid down that "tenant's machinery placed in a factory and used therewith in connection with the business, whether affixed to the freehold or not, *may be taken into consideration* so as to increase the amount in assessing the factory to the poor rate." The use of the term "tenant's machinery" is curious, if the decision means that such machinery is intended to be dealt with in the same manner as that provided by the landlord. It will be observed that the decision gives no direction or interpretation of the phrase "taken into consideration;" and this has led to great divergence in the practice of assessing machinery throughout the country. In some parts process machinery is eliminated.

The second decision referred to is *S. Smith & Sons (Motor Accessories) v. Willesden*, given by a Divisional Court, with no appeal, and which has not since been challenged. This decision involves the assumption that the rent is paid "for the right to occupy the building and use the machinery; it being assumed that the hypothetical landlord provided both the building and the machinery." The effect of this is to do something more than take the machinery into account; it actually rates it, and renders the term "tenant's machinery" a misnomer. For all practical purposes this decision lays down that the full annual value of all the machinery and plant upon the premises must be ascertained as if it were the property of the landlord—*i.e.*, part of the hereditament. This rule, however, is apparently not yet universally recognized, or at least not applied by Assessment Committees or Quarter Sessions.

The report of the Inter-Departmental Committee on the Rating of Machinery (which will be referred to later) considers that the view taken in the Willesden case is in accordance with the opinions of the Law Lords in the Hunslet case; and it is taken by the Committee as representing the present position relating to the subject. There is still some doubt as to whether the decision in the Hunslet case would not justify the application of the same principle to the furniture in an hotel, and fittings in a shop, office, or warehouse; or whether the principle might not be applied to include machines worked by hand or foot power and loose tools and tackle. It is agreed, however, that in practice no attempt has yet been made to extend the principle to the articles named.

Profits and the Hypothetical Tenant.

It should be noted that the contractor's method creates a hypothetical landlord and tenant, and these gentlemen have probably provided more scope for argument than any creation in literature. The system pays no attention to profits directly, but it may be accepted that the more extensive the factory and the more machinery it contains, the more is likely to be the profit, particularly when dealing with like industries.

Up to this point it might be possible to imagine two separate individuals as landlord and tenant. When public utility undertakings come up for consideration, however, there is no possibility in practice of separation, but the hypothetical tenant still remains the principal consideration in arriving at the value.

Rating of Public Utility Undertakings.

The rating of railways, canals, tramways, waterworks, gasworks, and such-like undertakings is a matter of extreme intricacy, and is usually handled by an expert in rating. The complexities may be imagined when it is remembered that the profit is all earned outside the factory or centre of production, and that the system may extend into very many parishes. The revenues may be earned in only part of these parishes, as the other part may contain only feeders or coupling-up lines or mains. In such an undertaking as described, the net revenue or profit forms the basis of the assessment (with certain adjustments), and the landlord and tenant are inseparable in so far as the total profit is divided between these two, and the rateable value cannot be ascertained until the net revenue of the undertaking as a whole is ascertained on the correct rating principle. Up to this point the two are very closely allied, and it is difficult to imagine any other tenant except the undertaking actually in possession.

VALUATION OF A GAS UNDERTAKING.

The gas-works valuation is typical of the other public utility undertakings described officially as "special properties." The net revenue being the basis, no argument arises as to how much profit another tenant could make if he improved the efficiency or altered the policy, as it is assumed that the existing tenant is running the business to its best advantage. Thus a municipality has a different form of statute from a company, and possibly different obligations, and therefore may not be liable to the same rateable value as a company in occupation of a similar hereditament. Therefore, though theoretically the rating surveyor is ascertaining the rent "a tenant" could pay, he is in fact regarding the existing undertaking as *the* tenant whose rent he is calculating.

As mentioned above, the profits form the starting-point of the calculation for assessment. The profits are not rateable as such, but are only intended to enable the assessor to calculate the rent a tenant would give; and it is obvious that the tenant would not give a rent equal to the annual profit or net revenue when he has important investments to make and substantial outgoings in order to maintain that profit. Outside the Metropolis the undertaking, in theory, is rated annually. In practice one assessment will last a number of years, or at least until the profit is substantially altered.

CAPITAL OF THE LANDLORD AND TENANT.

Having accepted the view that the undertaking must be treated as a whole (and many legal decisions have confirmed this) and the hereditament occupied and run precisely as it is at present, the way is clear to divide the property generally into two sections:

(1) The property of the hypothetical landlord.
(2) The property of the hypothetical tenant.

The parallel can be drawn in the case of an ordinary dwelling house. Owing to the existence of an actual landlord and tenant, the assessor would view a house, if necessary, and mentally eliminate the tenant's furniture and chattels, valuing the house only on the estimated rental which a tenant would pay, but including fixtures such as firegrates, baths, built-in wardrobes, &c.—in fact anything which is likely to affect the letting value and is usually supplied by the landlord. If the house contained such a lot of ready-built fixtures as would reduce the tenant's expense to make it habitable, then the rental value would be correspondingly increased. If a house is let furnished, then the rental value is not increased thereby, as the furnishing is an additional investment which may be provided by either party. If the custom of this country were to be the letting of furnished houses, the tenant would claim allowances for its maintenance; or if an attempt were made to assess a house furnished by the tenant on a furnished-house scale, then the tenant would claim interest on the capital he has spent, and maintenance of those items which contribute to the increased letting value.

With regard to the division of the capital assets, the first step is a structural valuation of the works, mains, services, meters, stoves, and appliances. The tenant is then allowed certain deductions relating to his portion of the undertaking, and the landlord is allowed his—the latter corresponding to one-fifth or one-sixth of the gross estimated rental in the case of houses.

There are many items which are accepted as landlord's and others as tenant's. In addition there are many things about which rating surveyors for many years have differed. Taking ships and railway wagons as an example, it needs no argument to satisfy one that no landlord would supply ships or wagons to bring coal from the collieries. He would hold that it is no part of his duty, any more than he would be expected to provide a delivery van for the daily bread of a householder. Among the admittedly tenant's property are ships, barges, wagons, lorries and cars, meters, stoves, fires, and all house appliances, office furniture, maps, skips, loose tools, portable pumps, mainlayer's tackle, cycles, collecting vans, laboratory plant, showroom fittings, &c. Among the landlord's assets are land, wharves, fixed pontoons, sidings, drainage, buildings, stores, boilers and houses, retorts and manufacturing plant, purifiers, washing and scrubbing plant, exhausters, fixed pumps and boosters, all apparatus for heating, lighting, and ventilating the works, and generating stations, cables for transmission of power, &c., offices, fixed storage hoppers, prime movers for workshops, tar and liquor storage tanks, charging machines, telphers, machine tools and shafting, chemical plant, and mains and service pipes. Among the debatable items are painting and spraying machines, travelling cranes, portable conveyors, semi-portable oxide breakers, and clinker washing machines.

The landlord's property is usually valued at costs operating at the time of construction, and no depreciation figure is applied, as the landlord's return is expected on the capital expended. He is allowed expenditure in repairs to maintain the property in a state to command the rent, and a depreciation fund to accumulate sufficient to replace each building or piece of plant as it wears out. The tenant's property is usually taken at the costs current at the time of construction, with a reasonable depreciation. The tenant going into the property would not expect to take these over at new value, and for these items also the permissible working expenses, or incoming rentals, produce sufficient to maintain the chattels and renew them on a post-war basis.

Having ascertained the correct division of the property between landlord and tenant, the latter must supply further money for the administration of the undertaking, or "working capital," often termed "floating." For a long time an amount equal to 5 to 6 months' working expenses, *plus* 6 or 7 weeks' coal, was claimed, with certain additions and deductions; but of late years the figure has become somewhat reduced. Since a large proportion of revenue has been obtained from coin meters, with usually two collections a quarter, there is no need for so much. Consequently adjustment is made for this as well as receipts for residual products collected during the said period. The coal allowance is often claimed at 8 weeks of winter requirements, as many undertakings find it more advantageous to buy in quantities more nearly equal to the average than to the actual use. As a result coal must be bought in summer to be accumulated for winter. Further adjustment is applied for the amount of credit obtainable, and a dissection made of the outstanding liabilities as between landlord and tenant. The actual needs for working capital vary considerably, dependent on the class of business, the seasonal demand (whether summer or winter), and the business relations between the sellers and purchasers. An examination of modern accounts will show, however, that one-quarter of the revenue expenditure as it appears on the printed accounts will be sufficient.

ASCERTAINING THE CORRECT PROFIT.

The next step is to examine the revenue account for the year on which the assessment is made (usually the latest available), and make any adjustments necessary to produce a typical and rateable profit. Any abnormal item would be eliminated or adjusted, such as a special non-recurring charge or obviously over-burdened repairs account. Rates and income-tax are cut out, as income-tax is a levy on profits, and the rental value has to be assessed before rates are considered, as in the case of a dwelling house. The repairs to works and mains can be dealt with in two ways:

(*a*) By eliminating both repairs and renewals, and claiming both items as a "statutable deduction" from the landlord's share of the profits.
(*b*) By claiming a reasonable allowance for repairs, and claiming the renewals in the statutables.

It will be noted that if the repairs are correctly adjusted the effect on the profit is the same, though the rateable value is altered slightly, due to the calculation of the necessary floating capital. The former is the more logical way, as it carries out specifically the line of investigation as between landlord and tenant. This is the method usually adopted now, though some years ago many valuations were prepared by method (*b*). This method avoids any lengthy investigation into the repairs necessary to the landlord's property and the tenant's chattels respectively, which is necessary under method (*a*). It was argued that the tenant could not be expected to be continually running to the landlord to carry out minor repairs, and that the landlord could, in a gas-works, be content to modify the rent accordingly, obtaining only a sinking fund allowance for the replacement of the buildings and plant.

With regard to the repairs of meters and cookers, these should in any case be left in as an expense, as it is a tenant's liability; and the same applies to the depreciation. The allowance which the tenant gets on his capital does not include anything for the repair and depreciation of his chattels. All the usual costs are allowed, including co-partnership, publicity and advertising costs, pension funds, and subscriptions to hospitals and similar contributions. The special purposes fund, insurance fund, and renewals fund will be dealt with later.

On the receipts side the gross rental is taken, as well as meter and stove rents and fittings profit. The stove and meter rental is paid by the consumer to recompense the tenant for interest on capital, repairs, depreciation, and collection, and possibly to provide a little profit as well. The first and last are claimed by the tenant in his allowance, and the other items in the expenses, so all the receipts should be included. With regard to the fittings, the capital of the tenant is partly used for this "ironmongery business" as well as the organization set up by the tenant for the gas business; and therefore it is fair to include the fittings profit with the gas profits.

In estimating the profit as well as the rateable value, a substantial difference of opinion may arise regarding the amount of repairs necessary to be expended by the landlord in order to ensure that the hereditament is kept in a proper state to command the rent, and the amount necessary by the tenant in order to maintain, repair, and renew his own chattels.

When times are good it is, of course, attractive to the responsible officers of an undertaking to improve out of revenue; and this is of great assistance in keeping down the capital expenditure or forming a reserve for hard times. There are many undertakings whose structural value on a depreciated basis would not be equal to the capital expenditure, having regard to the period during which the undertaking was being built up. It is true that a structural value on a post-war basis would produce a higher figure than the capital expenditure, and there is difficulty in finding the revenue to repair and replace the assets at the enhanced value.

From the rating point of view, the two methods in vogue of dealing with repairs and renewals have the same effect over a period of years. The two methods referred to are:

(*a*) Replacing the asset out of revenue as necessary.
(*b*) Depreciating the capital annually, and providing the renewal out of capital.

The effect is the same if the rate of depreciation is correct—*i.e.*, if the total allowance in each case is adequate. If in the case (*b*) the depreciation allowance is at too rapid a rate, then the capital account is benefited by being reduced faster than the asset wears out, and *vice versa*.

Mention has been made of insurance fund, special purposes fund, and renewals fund. No gas undertaking has the first two mentioned together, but many have the first and third or the second and third. The usual principle in ascertaining the landlord's repairs is to allow a reasonable charge per 1000 c.ft. of gas sold to cover the repair, maintenance, and renewals of the hereditament. Therefore all charges forming part of this allowance should be eliminated from the expenditure. Therefore the allocation to the renewals fund is not allowed as a working expense. Many undertakings which have not been to Parliament recently have an insurance fund, and the allocation to this fund is optional. It is intended to meet extraordinary charges arising against a company, caused by accidents, strikes, or other circumstances. The permissible annual charge is 1 p.ct. of the paid-up capital, with a total of 10 p.ct. It would appear, therefore, that there is a clear case to have this allowed as a working expense, as it does not refer to repairs or renewals. The modern special purposes fund however (which has the same annual and total limitation) extends the scope of the clause to include replacements or removal of plant or works other than maintenance or renewals. It is, therefore, debatable whether the special purposes fund should be allowed as a working expense; and there appears to be no regular practice respecting it.

With regard to the tenant's chattels, reasonable expenditure on the works' chattels is permitted; and this figure is usually assessed at pence per 1000 c.ft., dependent on the amount of chattels necessary to conduct the undertaking. In the case of undertakings owning ships, lorries, &c., separate accounts are usually kept; and it is not difficult to estimate a figure for the remainder. The expenditure on meters, stoves, and coin-meter fittings is usually separate, and this expenditure must be sufficient to provide depreciation or renewals as well as ordinary repairs. Whatever system is adopted in calculating the various allowances for repairs of the landlord's and tenant's property, the total expenditure permitted to both should form a reasonable sum for repairing, maintaining, and renewing the works, mains, meters, stoves, and appliances.

It should be noted that no bank loan charges, interest on deposits, or debenture or mortgage interest is allowed to be charged as an expense. Such items are clearly charges on capital. If not, an undertaking would finance itself up to the hilt out of bank loans, charge the interest as an expense, and then pay a large dividend on a comparatively small capital. However, having satisfied all parties that the correct expenditure has been included, the difference between expenditure and receipts forms the gross profit or net receipts *plus* rates.

Tenant's Allowance.

The tenant's working capital is then calculated by adding the agreed proportion of the annual adjusted expenditure to the tenant's capital according to the valuation. We now arrive at the vexed question of the percentage on his total capital to which the tenant is entitled in order to ascertain his deduction before the landlord's share of the profits can be assessed. For a large number of years the figure of 17½ p.ct. was claimed by custom, and allowed in repeated appeals. This amount was made up as follows:

5 p.ct. for interest;
10 p.ct. for profit;
2½ p.ct. for risks and casualties.

Since the amount of tenant's capital has reached such a high figure, due to the increase in prepayment installations, cookers, and fires, many rating authorities have challenged the 17½ p.ct. There have been many unofficial settlements at lower amounts, but no rule has been laid down by law since the 17½ p.ct. was established. As low as 12½ p.ct. has been agreed; and many rating surveyors are of the opinion that 15 p.ct. represents an equitable figure. The tenant occupies a sheltered position to the extent that he has no competition in his particular line of business. His capital is usually obtained cheaply, and he cannot expect an annual "profit" of 10 p.ct. as well as the 5 p.ct. allowance for borrowing the money. In other words, he cannot in his peculiar position expect 15 p.ct. return gross if he should be forced to find all the money himself. He could put the money into an equally safe security at a rate of probably 6 to 7 p.ct. without any trouble or anxiety, but even then the difference is too marked, seeing that he has a further margin of 2½ p.ct. for risks and casualties. He should be entitled to something for risks, for it must not be forgotten that the landlord is sure of the rent, which is the first call on the profit. Thus 10 p.ct. reduction in the gross profits may mean 20 p.ct. loss of the tenant's share. Assuming that the percentage has been settled, this is applied to the capital, the calculation resulting in the tenant's share of the profits or net receipts. The balance is the landlord's share, or the "gross estimated rental," *plus* rates.

Statutable Deductions.

As in the case of any other property, the landlord (or the occupier if he is owner) is allowed certain deductions to enable the property to be kept in a state capable of commanding the rent—*i.e.*, of earning the profit. This is for the repairs and the renewal or sinking fund necessary to provide for the replacement of each asset as it wears out, and, as before mentioned, is usually arrived at by a lump sum expressed in pence per 1000 c.ft. to cover works and mains. The figure of 12d. is not unreasonable. An alternative method is to use the structural valuation for the purpose of calculating a reasonable renewal fund, as one works may have a much larger proportion of its capital in machinery than another, and add the repairs proper. The example which will be worked out will show a method of calculating this renewal fund by taking a broad division of assets, but the items could be further divided—in fact, extended indefinitely—with varying percentages allocated to each class.

The landlord's insurance is usually calculated on the buildings and plant which would be usually insured, and may only amount to one-quarter of the total capital expenditure; the tenant's insurance being allowed in working expenses. After the "statutables" are deducted, the balance is the net rateable value for works and mains *plus* the rates. It is now possible to get a fairly accurate division of the rateable value by deducting the average rates in the £ over the whole undertaking; the balance producing a figure which will be very near to the net rateable value of the whole undertaking. Thus, if 12s. 6d. were the average, the net rateable value *plus* rates represents 32s. 6d.; and $\frac{12s.\ 6d.}{32s.\ 6d.}$ should be deducted to represent the rates, leaving a figure corresponding to 20s. as the net rateable value. The merit of eliminating the rates is now apparent, because, had they been left in the expenditure, the sum might have been substantially more or less than the valuation produces.

Apportionment of Net Rateable Value.

The actual apportionment between parishes is usually done in a more accurate manner, however; the first step being to divide the figure of net rateable value *plus* rates into two parts:

(1) The indirect productive portion, sometimes called the "unproductive portion," comprising the works, land, and trunk mains.
(2) The balance representing the directly productive portion, which actually earns the revenue and which is arrived at by deducting the indirectly productive portion from the total.

Both these portions include the corresponding rates.

The unproductive portion is usually valued at 4 to 5 p.ct. on the capital value, thus introducing the contractor's basis. Having ascertained the correct figure, the rates at the figure in the £ operating in the parish in question are added, and the total represents the rateable value *plus* rates of the unproductive portion. The difference, therefore, represents the productive portion *plus* rates. This is apportioned between the various parishes. Each parish then has allocated to it the total amount of rateable value *plus* rates, and in each parish the relative rates in the £ are adjusted, leaving the net rateable value. The total net rateable value of the unproductive portion *plus* the productive portion in the respective parishes then represents the net rateable value of the whole undertaking.

As indicated above, there are certain adjustments to be made in connection with trunk mains—*i.e.*, mains used solely for the purpose of conveying gas from one portion of the district to another. These are treated as non-productive works. The same applies to outlying booster or governor stations. Land and buildings let to other occupiers are separately assessed, and the same is usual in the case of houses occupied by employees.

A Typical Case.

The typical case is taken of a works selling about 500 million c.ft. per annum, or 2,500,000 therms, at 10d. per therm or 4s. 2d. per 1000 c.ft.

Structural Valuation.

	£
Land, works, buildings, fixed plant and apparatus	129,000
Mains and services pipes	111,000
Tools, wagons, lorries, office furniture, plans, laboratory plant and chattels	10,000
Meters, cookers, prepayment installations, gas fires, &c.	83,000
	£333,000

Of the above, £54,000 on the works subject to insurance by the landlord.

Annual Expenditure and Receipts per Revenue Account.

EXPENDITURE.	£	RECEIPTS.	£
Coal, oil, &c., including handling	67,300	Ordinary gas rental (average receipts 9·8d. per therm)	39,400
Wages, salaries, purification	13,300	Prepayment gas rental (average 10d. per therm)	45,300
Repair, maintenance, and renewals of works) 9d. per 1000 c.ft.)	18,750	Contracts and public lamps (average 8·6d. per therm)	16,100
Repair, maintenance, and renewals of mains and services (3·6d. per 1000 c.ft.)	7,500	Meter and stove rentals	7,900
Repair and maintenance of meters and stoves (2·4d. per 1000 c.ft.)	5,000	Prepayment rentals	10,850
Depreciation of meters and stoves (3d. per 1000 c.ft.)	6,300	Residual products	38,900
Public lamps (balance of expenditure)	900	Fittings profit and sundries	1,750
Rates	4,200		
Income-tax (on profits)	550		
Co-partnership	1,450		
Special purposes fund	2,500		
Sundries, management, &c.	8,600		
Total expenditure	£136,350		
Gross profit	23,850		
	£160,200		£160,200

The following would be the adjusted tenant's receipts and expenditure:

EXPENDITURE.	£	RECEIPTS.	£
Coals, &c. £67,300 *Less* residuals 38,900	28,400	Gas rental (as above)	100,800
Wages and salaries purification	13,300	Stove and meter and prepayment rentals (as above)	18,750
Repair and maintenance tenant's chattels on works	2,100	Fittings and sundries	1,750
Repair and maintenance and depreciation of meters, stoves, and fittings	11,300		
Public lamps	900		
Co-partnership	1,450		
Part special purposes	500		
Sundries, management, &c.	8,600		
	£66,550		
Adjusted profit or net receipts	54,750		
	£121,300		£121,300

Working Capital.

	£	
4½ months of tenant's expenditure *plus* residual receipts deducted previously £105,750 — 37½ p.ct.	39,680	N.B.—25 p.ct. of annual expenditure of £136,650 as per revenue account = £34,160.
8 weeks' stock of coal at maximum rates	13,500	
Stocks of meters and sundries	7,500	
6 months' rates	2,200	
	£62,880	
Less—		
Max. quarter's coin meter rents £17,500		
Quarter's residual receipts 9,700		
Consumers' deposits and credit allowed 2,200	29,400	
	£33,480	

Total Tenant's Capital:

	£
Working capital, including stocks	33,480
Tools, wagons, chattels, &c.	10,000
Meters, stoves, &c.	83,000
	£126,480
Tenant's share of net receipts at 15 p.ct.	£18,970
Adjusted net receipts or gross profit	54,750
Landlord's share or gross estimated rental *plus* rates.	£35,780

Statutable Deductions:

Repairs, maintenance, and renewals of works and mains (at 1s. per 1000 c.ft.)	£25,000	
Insurance £54,000 at 7s. 6d. p.ct.	200	
		25,200
Net rateable value *plus* rates		£10,580
Unproductive portion of the works and land. £129,000 at 4 p.ct.	£5,160	
Plus rates at 12s. 9d. in the £	3,290	
		£8,450
Leaving balance productive portion *plus* rates		£2,130

Apportionment:		Net Rateable Value.
Parish "A" provides 30 p.ct. of the gas and rental	£640	
Less Rates 12s. 9d. / 32s. 9d. representing 12s. 9d. in the £	249	
		£391
Parish "B" provides 44 p.ct. of the receipts	£936	
Less rates 12s. 6d. / 32s. 6d. representing 12s. 6d. in the £	361	
		575
Parish "C" provides 26 p.ct. of the receipts	£554	
Less rates 12s. 5d. / 32s. 5d. representing 12s. 5d. in the £	307	
		247
Net rateable value directly productive part		£1,213
Net rateable value unproductive part		5,160
Total net rateable value		£6,373
Add rates £3290		
249		
361		
307		
		4,207
Net rateable value *plus* rates as above		£10,580
Total rateable value—Parish "A" £5160 *plus* £391 = £5551		
Parish "B" £	575	
Parish "C" £	247	
		£6373 as above.

If the calculation for sinking fund or renewals fund were made separately, *plus* a reasonable charge for repair and maintenance, the following would represent the calculation:

—	—	At 5½ P.Ct. Compound.	Annually.	Useful Life.
	£	P.Ct.	£	
Buildings	27,000	0·56	151	50 years
Machinery and plant	67,000	3·72	2492	18 years
Gasholder	28,000	1·64	459	30 years
Mains	87,000	0·93	809	40 years
Services	24,000	3·19	766	20 years
	£233,000	..	£4677 = 2·25d. per 1000 c.ft. sold.	..

From the example given, it is seen that the rateable value is about 27 p.ct. of the gross profit; but the Company are paying rather more in total expenditure on the maintenance of the undertaking than the circumstances would justify. Actually the rates paid in the year on which the account is based are £4200, against £4207 in the final calculation; but this is mere chance. It may have been much more or less. It should be noted that the life for the calculation of depreciation need not necessarily be the physical life of the article. Obsolescence may necessitate renewal, or the scale of the works may cause the piece of plant to become too small.

The undertaking is, of course, valued as a whole, and it is the duty of the rating assessor or expert on behalf of the union to apportion the rates between the parishes. It often happens that when a new building is being erected the union in which the works is situated makes an increased assessment; and when new mains are laid in another parish, an increased assessment follows. In this manner the total assessments may be increased out of all proportion to the merits of the case. If a new building does not mean increase of profits, then the assessment should be slightly higher in that parish and slightly lower in all the others.

EFFECT OF REDUCED CAPITAL.

It has been mentioned that the rateable value is not dependent on the profits, but that the profit forms the starting point of the calculation. It will be of interest to see the effect of a lower capital on the rateable value of the undertaking selected. Assume that the capital in all sections is two-thirds of the figures given, with the profit unaltered:

The adjusted profit, as before, is		£54,750
The total tenant's capital is:		
Fixed	£62,000 (⅔ of £93,000)	
Floating	33,480	
	£95,480	
Tenant's share (15 p.ct.)		£14,322
∴ Landlord's share or gross estimated rental		£40,428
Statutable deduction (⅔ of £25,200)		16,800
Net rateable value *plus* rates		£23,628
Deduct rates. Average 12s. 6d. / 32s. 6d.		9,087
Net rateable value		£14,541
Unproductive portion works and land £86,000 at 4 p.ct.		3,440
Balance productive portion		£11,101

So that the total rateable value is nearly 130 p.ct. in excess of the previous figure; and parishes containing mains only have an assessment over nine times as much as the previous figures.

COMPARISON BETWEEN GAS UNDERTAKINGS AND OTHER INDUSTRIES.

It seems curious that public utility undertakings appear to be a sort of Aladdin's cave for assessment authorities. Provisional assessments are often made at grotesquely high figures, which are reduced to more reasonable proportions when the undertakings show fight or get professional advice, or when the rating authorities are assisted by experts with reasonable ideas. The gas undertaking is usually rated much higher than other industries with like capital, turnover, or profit in the same town, and are generally higher than electrical undertakings in the same district. There seems to be a mistaken idea that the gas, water, or electrical undertaking should pay additional rates for opening the roads. It is forgotten that the opening is for the requirements or necessity of a ratepayer, and that the owners of vehicles who wear out the roads only contribute indirectly and partially for the upkeep.

It is admitted that the public utility undertaking is in a specially favoured position in respect to many things, and enjoys a complete or partial monopoly; but it must not be forgotten that these powers and privileges are created by the very nature of the business. In the case of gas undertakings the rights are accompanied by very severe restrictions and obligations. The capital is limited, the proportion of loans is limited, and the manner of raising the capital is prescribed. The price and quality of the articles sold are subject to control, and the divisible profits subject to strict limitation, and on such a scale that no capital would be forthcoming unless associated with statutory power and limited monopoly.

COMMITTEE ON RATING OF MACHINERY.

In 1924 the Government appointed a Committee to inquire into the present law and statutes in regard to the rating of machinery, and to make recommendations relating to any desirable and practicable alteration. This Committee consisted of nine members, eight of whom issued a joint report, and the remaining member a separate report. The Committee appreciated that there was a great difference in practice in different parts of the country regarding the extent to which machinery is rated, and that, on the whole, machinery was rated less in Scotland than in England.

With regard to special properties, the Committee came to the conclusion that they should be excluded from the scope of their proposals. The Committee could not arrive at a definite figure to show the effect of the total exemption from trade machinery; but it was given at approximately 6d. in the £ in urban areas, and 1s. 3d. or even more in highly-rated areas.

The following is a summary of the recommendations of the joint report:

(1) That the present practice of excluding from the valuation loose tools, plant, and machines operated by hand or foot, be continued and approved by the Legislature.

(2) That in valuing hereditaments containing machinery and plant (other than special properties), such machinery and plant, except loose plant above mentioned, shall be taken into account in estimating the value, and shall be deemed to be part of the hereditaments.

That this machinery and plant shall be divided into two classes, the first representing broadly what has been described as first motive power, and the balance put in Class 2. That the Class 2 machinery should be stated separately, and pay only 25 p.ct. of the full rate.

The separate report drew attention to the effect of exemption of any class of machinery on the tenant's capital of a public utility undertaking, with the consequent increase in the tenant's share and a reduction of the average rateable value. This report stated that the safeguard—viz., that of excluding special properties—creates an invidious distinction in rating law which would be detrimental to certain unions, and recommended no alteration in the present law other than in purely administrative matters.

THE NEW RATING AND VALUATION BILL.

The Rating and Valuation Bill is before the present session of Parliament, and has had a great amount of time devoted to it in Committee.

By this Bill it is proposed that the council of every county borough and urban and rural district shall be the rating authority. As far as the urban district rating areas are concerned, the rates shall be consolidated and form a "general rate." As far as rural districts are concerned, there shall be one rate, called a "special rate," which covers expenditure under the Lighting and Watching Act, 1833, and special expenses under the Acts relating to public health.

The valuation areas shall be county boroughs, and in other districts such areas as shall be constituted by the county council and approved by the Minister of Health. Each valuation area will have its assessment committee, on which there will be representatives of the board of guardians. The Commissioners of Income-Tax were included in the original Bill, but have been excluded during the progress of the Bill through Committee. The valuation list is to contain the gross and rateable value as and when determined by Parliament. The gross value shall be taken as evidence of the annual value for the purpose of income-tax.

With regard to the rating of machinery, the recommendations of the Departmental Committee are adopted to some extent, but complication is introduced for the purpose of classifying all the machinery. The valuation for the rating of machinery as such does not apply to any property whose rateable value is ascertained by reference to the accounts, receipts, or profits. Special properties, such as railway companies, gas undertakings, &c., come up for special treatment. A special body is to be created, known as the Railway Assessment Authority, who will determine the net annual value as a whole of any railway undertaking, and this determination shall be made by reference to the net receipts of the undertaking. The amount of the net receipts shall be "equitably divided as between a hypothetical landlord and a hypothetical tenant, and the amount apportioned to the landlord shall be deemed to be the net annual value of the undertaking."

Under the Bill, gas undertakings can be valued by the Assessment Committee or by the Railway Assessment Authority. If by the latter, appeal can be made to the Railway and Canal Commission. There will be no appeal to Quarter Sessions against the decision of the Assessment Committee, but appeal must be made to the Railway Assessment Authority, and from that tribunal to the Railway and Canal Commission as before. To this extent, therefore, the valuation of special properties will be diverted to one body. This may be an advantage or the reverse. Whether special properties are valued by the Railway Assessment Authority or by the Assessment Committee, the same basis must be adopted—viz., the valuation shall be determined in accordance with the general provisions of that part of the Act, and shall be determined as a whole, and the value apportioned between the several parishes on such basis as may appear just to the Assessment Authority.

There is one ambiguity in the Bill which constitutes a weakness. Section 43 prescribes that special properties valued by the Railway Assessment Authority are to be valued according to the provisions of the special properties section, clauses 36 to 41, "except the provisions relating to the ascertainment and apportionment of the values of railway undertakings."

Now section 39 gives a lengthy series of indications for arriving at the valuation of a railway, down to the division between landlord and tenant; but at the end of sub-clause (4) the following words occur: "The authority and any such court (of appeal) shall not have regard solely or primarily to the return to which the tenant is entitled." There appears to be no corresponding indication of the method of assessing other properties which are undertaken by the Railway Assessment Authority, and fears have been expressed that this body may adopt the "railway principle" when dealing with gas-works, and regard the tenant's return as of no importance. It has been shown in this contribution that the tenant's interest is of vital importance, and necessary as long as the principle of landlord and tenant is followed in the valuation of gas undertakings.

It may be argued that by the present method a profit earning undertaking can be reduced to a "*nil*" valuation by giving the tenant all he is entitled to; but as long as the division of the profits between landlord and tenant is part of our rating hypothesis, this must continue so. In fact, a Scottish Court of Quarter Sessions held that they saw nothing illogical in finding a net value of "*nil*" for a certain gas undertaking.

With regard to the rating of machinery in special properties, there is no change in the situation—*i.e.*, items which have been regarded as tenant's chattels in the past shall remain the same.

From the point of view of the gas industry, therefore, the features of the new Bill may be briefly stated as follows:

(1) The simplification of the number of rating authorities.
(2) The creation of a new tribunal for the rating of gas undertakings and others of a like nature.
(3) The possible interference with the tenant's return on investment.
(4) The possible effect on the incidence of rating due to the alteration in the system of rating of machinery.

With regard to the last, it is difficult to state whether the rates in the £ will be increased, as there are so many conflicting elements. As far as the Bill itself is concerned, probably the rates in the £ will be increased, due to the comparatively low rates of the bulk of machinery in the country; but the probable all-round increase of the rateable value of house property will neutralize this.

[NOTE.—Since the above has been in type, the Government have withdrawn the clauses relating to "special properties" in order to expedite the passage of the Bill through Parliament. It is the intention of the Government to promote a separate Bill next spring dealing with special properties on similar lines, and to get this latter Bill through in time to enable the procedure relating to properties affected to operate at the same time as if the clauses in the present Bill had been retained.]

Discussion.

Sir HENRY KEITH (Hamilton, N.B.) expressed his gratitude for the great amount of information contained in the paper. There were differences between the principles of rating in Scotland and those obtaining in England. In England the legal liability for rating rested upon the occupier always. There were modifications in the practice relating to small houses; but the legal obligation was an occupier's

obligation. In Scotland things were not quite the same; and in the case of (say) a gas undertaking, the landlord was equally liable for rates with the tenant. Thus the distribution of the various items referred to by the author was probably of less real consequence in Scotland than it was in England. The special point, however, in regard to gas and water undertakings which was brought out by Mr. Evetts in his paper was that the valuation was upon the profits. Now, there was probably no other interest—except it might be in the case of public houses—in which the profits or the income formed the basis of assessment for rating; and it was a question whether it was fair that profits in the case of public utility undertakings should be the basis of rating when such a practice did not prevail in connection with any other form of industrial undertaking. The effect of this difference was that a very much larger share of the contributions for rates might be paid by a public utility undertaking than it was fairly called upon to bear. What was wanted was that every person should pay in proportion to ability for the social services of the State. This was a totally different thing from the present system. Men with vastly different incomes might live in similar houses side by side. Was it fair that each should pay in proportion to the rent of the house, and not in proportion to his income? Both men should be paying on their incomes; but it was wrong that gas and water undertakings should be rated upon their income, when no private person was assessed in the same way. Everybody's profits and income should be the basis of local rating.

MR. ARTHUR VALON'S VIEWS.

Mr. ARTHUR VALON (London) pointed out that, although it was quite true that the profits—that was, income—were taken into consideration in fixing the rateable value of gas or other public utility undertakings, it was only as a means of arriving at the rent which a tenant would pay; and this was the basis upon which every other person was rated at the present day. Public utility undertakings were not rated upon a different principle; but in their case the profits had to be considered in arriving at the rate which should be paid. He found that in most cases rating on the rateable value arrived at in the ordinary way placed a less impost on a public utility undertaking than any alternative that he had ever heard suggested—certainly much less than taking any reasonable percentage upon the cost of construction. It was as well to remember this when they were talking about the inequality of rating public utility undertakings under the present system. Mr. Evetts in everything he dealt with was interesting and illuminating, and generally controversial; and this paper was no exception to the rule. In his paper, the author said: "The landlord's property is usually valued at costs operating at the time of construction, and no depreciation figure applied, as the landlord's return is expected on the capital expended." It did not matter a bit what the landlord spent. It depended on what the tenant was prepared to, and could, pay. He thought, therefore, that this statement was founded on a misapprehension. They were bound by the wording of the Act, which said, in effect, that the rateable value was to be determined by an estimate of the rent which a tenant would pay. Now, the rent which a tenant would pay had nothing whatever to do with the cost involved in erecting the works, possibly many years previously. If cost had any bearing on the matter at all, it would be the present cost of replacing; but even this was not correct. They had to take into consideration what it would cost to provide a plant which would do the tenant's work for him. Supposing they had an engine put down thirty years ago, and at the present time one could replace it with another engine at half the cost, and that engine would have twice the efficiency of the earlier one. No tenant would give more rent for the old engine than for the new one, whatever it might originally have cost. So that the value of the old engine was no more than the value of the new one, and might be a good deal less. Again, a gas-works grew up, by being added to from time to time; and there might be ten gasholders where three larger ones would be more convenient, and cost a great deal less. The tenant would not pay any more for the ten holders than he would for the three; and so he contended that the original cost of the works had nothing whatever to do, or might have nothing whatever to do, with the question. What had to be determined was the structural value; and in this cost was only one element which had to be considered. Then there was the question of the 17½ p.ct. Mr. Evetts appeared rather to suggest that 15 p.ct. was reasonable; but he had not given them any reason, except perhaps that it was lower. He (the speaker) would like to have more reasons than this. The rate of return which the tenant would expect on tenant's capital was not necessarily the only thing that had to be considered in determining the tenant's share. What one had to get at was how much the tenant would require to enable him to carry on the undertaking; and it was only after this had been allowed for that one could find out how much he had left with which to pay rent to the landlord. But the amount of capital he would have to provide, although very important, was not the only thing he would have to consider; and he (Mr. Valon) was going to suggest that the true percentage required on tenant's capital would depend on the undertaking itself. In the case of one undertaking, a much higher percentage might be required than in the case of another. For instance, in one case the profit might be a good deal more secure than in another. He was not going to suggest what the figure ought to be; but he was going to say that what they had really to look at was this: Imagine a tenant company having to provide the necessary capital by means of shares, which would have to be subscribed for; the company being on a yearly tenancy, and having to pay a certain rent, whatever the result of the year's working might be—even if it were a loss. Then, taking this and other matters into consideration, try to determine what return would be required at the market rate on money invested in these shares. He thought they would find that the market rate of return on money invested in gas shares today, where the company was both landlord and tenant, would be very much lower than would be required in the circumstances he had indicated. Two other points which should be taken into consideration, and would simplify matters, were the price of gas and the statutory limitation of divisible profits. To give only one instance of the effect of the price of gas: Supposing repairs and maintenance cost 15d. per 1000 c.ft. one year, and only 1s. in the following year, all other things being equal no extra profit would be made; the price of gas would be 3d. per 1000 c.ft. lower. This principle one could apply in many other directions. In regard to the limitations of profits, it seemed ridiculous to make a valuation which showed a profit far greater than the company were entitled to divide, or, on the other hand, far less than the company, as a matter of practice, had regularly divided in the past and were likely to continue to divide in the future.

The CHAIRMAN remarked that when preparing an estimate for the tenant's capital, one was allowed a certain amount for the coal stock which had to be kept; and in these days the uncertainty which existed in the coal industry had a remarkable influence on the coal stocks that had to be maintained. He hoped that in any valuations made in the future this important fact would not be lost sight of. Perhaps it would be well if he took the opportunity of reminding those present that the Institution of Gas Engineers could not accept responsibility for personal statements made at that conference. Controversial figures—such as whether a fair deduction for tenants' allowance was 15 p.ct. or 17½ p.ct.—must be regarded as expressions of opinion.

REPLY BY THE AUTHOR.

Mr. EVETTS said he had purposely omitted reference in his paper to Scottish rating, because he knew very little about it, except that it differed in material points from the English system. In discussing the basis upon which one should pay rates, Sir Henry Keith was taking sides regarding a matter which was referred to in the paper under the heading "An Equitable Basis of Valuation"—namely, whether a person should be assessed on his ability to pay or on the rent he actually did pay. It was, he thought, assumed generally among the authorities that the rent which was paid was a rough indication of the services one received from the municipality. Sir Henry Keith appeared to think that the social services rendered were only a secondary consideration; the primary one must be ability to pay. As to the statement "The landlord's property is usually valued at costs operating at the time of construction, and no depreciation figure applied, as the landlord's return is expected on the capital expended," Mr. Valon was quite right in arguing that if, after working out the valuation, the landlord did not get a return for his expenditure, it did not matter. He quite agreed; but his point in introducing this sentence where he did in the paper, was that, in working out the value of the landlord's property for the purpose of maintaining it, it was necessary to prepare a valuation on some basis; and on the last two or three occasions on which he had made valuations at the instance of rating surveyors, he had been told that a structural valuation had to be got out—not on the basis of post-war costs, but of costs at the time when the particular buildings and plant were erected. He was afraid the remark at the end of the sentence was more in the nature of a pious hope than a statement of what actually did come about, when they arrived at the amount left for the landlord. As for the figure of 15 p.ct. for tenant's allowance, in nine cases out of ten the tenant of a gas undertaking could not expect 10 p.ct. for his profit, as well as 2½ p.ct. for his risks. The facts of every undertaking should be gone into. It seemed to him not unreasonable, however, to cut down the 10 p.ct. profit to 7½ p.ct., coupled with 2½ p.ct. for risks. The figure of 15 p.ct. had been accepted by many rating authorities; but it did not follow that it would apply to every undertaking. Regarding the price of gas and the limitation of profits, he had always thought it a mistake to take the last available balance-sheet, which might not fully reflect the circumstances of the company. An average profit was a much better basis upon which to assess an undertaking than the profits for the last available year.

The authors were cordially thanked by the CHAIRMAN for their papers.

Thornley Briquette Binder.

Various qualities which are desirable in a briquette binder are said to be found in the Thornley binder, a description of which has lately appeared in the "Colliery Guardian." This is a patented product, in which the active constituent is derived from sea-weed; and a large factory for its manufacture has been erected at Stromness, in the Orkney Isles. The sea-weed is harvested, and stored in a sea-water sump, the sides of which form quays for the town's shipping. From the sump the sea-weed is transported by conveyors to leaching tanks, where the soluble salts are extracted. The leached weed is next transferred to grinding mills, and then into digesters, where it is converted into a fine pulp. The pulp is taken to incorporators or autoclaves, where under heat and pressure it is mixed with about 50 p.ct. of its bulk of bitumen. Here a stable emulsion is formed which is run out into sumps and allowed to cool. This sets into a solid mass, and is broken-up in the same way as pitch for shipping in bulk. In the manufacture of briquettes, the Thornley binder is used in exactly the same manner as pitch, but, it is claimed, under more economical conditions. No alteration of plant is necessary. Briquettes made with this material as a binder are said to give 20 to 25 p.ct. higher cohesion tests than similar briquettes made with pitch. They are waterpoof, improve during storage, and stand the rough handling of sea transport without breaking. The binder has been tested-out on all kinds of coals, from anthracites to lignites, with eminently satisfactory results.

PUBLIC WORKS, ROADS, AND TRANSPORT EXHIBITION.

Further Notes of the Exhibits.

In the account of this Exhibition and Congress which was given in last week's issue of the "JOURNAL" it was impossible to describe in detail all the exhibits of interest to the gas industry. Mention was made of some of them; and the remainder are briefly described in the following notes.

PIPE CUTTING AND DRILLING.

A stand which created a great deal of interest was that of Weston, Shipley, & Weston, Ltd., of Leicester, who showed their pipe cutting, drilling, and tapping machines.

Demonstration was made of the "Driltaparatus"—a portable machine for drilling and tapping holes in gas and water mains under pressure, the supply being in no way affected during the operation. Cast iron, steel, and concrete-lined mains ranging from 3 in. to any diameter can be drilled and tapped; and the work is done quickly. Ordinary trenching is all that is necessary. The lower end of the machine has a circular groove worked in it, and a fibre washer is housed in the bottom of the groove. This is arranged to receive the spigot of the saddle, which is an interchangeable aluminium part fitted with leather and rubber pads. The saddles have a spigot on one side, and are curved on the other to suit the various diameters of mains, so that each size of main requires a suitable saddle. A special form of chain is provided having trunnions on each side of each link which engage in housings at the base of the machine, so that the length of the chain being used can be easily varied. With this form of chain, all diameters of main can be covered. An efficient shut-off valve is provided at the base of the machine, which is used when removing the head of the machine for inserting a ferrule or connection after the drilling and tapping operation has been completed. The feed ratchet has a two-way pawl. The drilling and tapping ratchet can also be used in either direction, and can be instantly removed when necessary. When attached to a main, the fibre washer in the base of the machine and the leather and rubber pad on the saddle make a gas or water tight joint. It may be mentioned that all "Driltaparatus" machines undergo a series of tests during production, so that gas-tightness is ensured. Selection of materials is also carefully carried out; steel alloy castings being used.

THE "KUT-OUT."

Another piece of apparatus exhibited by the same firm—and one of equal interest—was the "Kut-Out," which is a new portable machine for cutting gas and water mains, and analogous work. It can be used with equal advantage, we were informed, in a trench or on the level, making a clean, true cut, equal to cutting-off in a lathe, so that a piece of main, cast-iron or steel, can be cut away and lifted clear without any possibility of disturbing the joints on the adjacent ends of the main. The safety factor, too, is important, as there is no chance of breaking or cracking the main. The standard "Kut-Out" is operated by hand; but a portable power attachment can be supplied, which is rapidly set up, and greatly increases the cutting speed. The hand drive has two handles of generous dimensions, and the operators stand in a convenient place away from the main, which gives every opportunity for speedy work, and does not necessitate more than ordinary trenching for the cutting operation.

A No. 1 "Kut-Out" for cutting a 10-in. gas main $\frac{5}{8}$-in. thick was set up in fifteen minutes, and the cut made in fourteen minutes by two operators. The time for cutting a 6-in. main is seven minutes. Exhaustive tests have been made on a 24-in. main $1\frac{3}{16}$ in. thick. In one case a piece of 0·07 in. (practically $\frac{1}{16}$ in. long) was cut off without any cracking of the thin piece of the main taking place—which demonstrates the steady cutting of the machine.

Many novel features are embodied in the "Kut-Out." The bearing ring, which is of generous dimensions, is rapidly centralized on the main by six jacks, these being arranged so that, whatever size of main is being cut, the three jacks on the underside can be set so that, when the three on the upper half are screwed up, the bearing ring is automatically centred. The jacks are staggered in the bearing ring, so that they form a double ring of contacts on the main, and give solid fixing of the latter without undue screwing-up. The gear ring has machine-cut teeth, which ensure smooth running. On the front face three housings are formed having locating grooves; and these carry the cutter heads. The latter are interchangeably detachable, and can be fixed on the gear rings in varying positions, so that the cutter holder does not extend beyond the bearing of the cutter head, every size of main having the same solid cutting condition. Regarding the driving unit, an extension can be supplied if required, so that, when cutting out (say) a foul main, the operators can be several feet away from it.

CLOCK CONTROLLERS.

Last week mention was made of the stand of the Horstmann Gear Company, Ltd., of Bath, who showed, among other things, a controller with an astronomical dial. Clock controllers of all types were exhibited also by Metropolitan Gas Meters, Ltd., of Nottingham and London. Their "Duplex" convertible gas lighter and extinguisher, though simple, performs many functions, as the following will indicate. It can be set to operate once or twice in 24 hours at will, and is instantaneous in action. It can be set to light up at any time and to extinguish at any time after an interval of two hours, light up again at any time after a minimum interval of one hour, and extinguish again any time after an interval of two hours. It is of interest to note that the by-pass is extinguished during lighting hours. The lamp can be turned on by hand, if desired, without disturbing the normal sequence of operations. The valve can be cleaned, if necessary, without removal; and the clock, which is entirely enclosed in a dust and insect proof case, has fully jewelled escapement, and has also an arrangement for starting. The controller itself is small (the height from the base of the socket to the burner nipple can be made as low as 2½ in.), and can therefore be fitted into small lanterns. Another important feature is that the controllers can be interchanged without disturbing the connection to the service. The appliance is fitted with a swivel connection allowing the by-pass to be turned away from the mantle when this is being renewed or adjusted, thus minimizing risk of breakage. Finally, the "Duplex" controller can be changed from upright to inverted, or *vice versa*.

Ordinary, prepayment, and stop-action dry meters were also shown by the firm; one of particular interest being the "Metro" gas-fire meter which is adapted for hotels, boarding-houses, &c.

WHY BRITISH TAR MAKES EFFICIENT ROADS.

Though attention was drawn in last week's "JOURNAL" to the fact that the British Road Tar Association had an information bureau at the exhibition, no excuse is needed, in view of the importance of the work carried out by the Association, for once again referring to the subject. The information which the Association offered ought to be more generally impressed on the British public, who are fighting against their own interests when they use a foreign material for road construction or surfacing. The importance of low first-cost in road construction is self-evident; and it is in this direction that tar macadam offers one of its most substantial advantages. British tar, combined with suitable aggregates, is not only much cheaper than other forms of road-making material, but is less expensive to lay. Like other materials, tar macadam calls for adequate foundations, but these need no elaborate preparation. To be efficient, a road must be able to stand up to every condition of weather, and to bear continuous fast-moving and heavy traffic for long periods. British tar, to specification, properly mixed with approved aggregates, and carefully laid makes a road which compares favourably with those made with any known road-making materials, and is in several respects superior to these. Tar provides internal as well as external binding qualities, and ensures a close-bonded mass free from the evils of corrugation, chipping, and surface disintegration, when subjected to traffic. Moreover, tar-macadam roads provide the necessary amount of resiliency to absorb impact shocks—a feature which is as beneficial to the life of the road as it is to the traffic that uses it. Tar macadam mixed with a suitable aggregate provides just that slight amount of "roughness" to give the tyre-grip necessary to prevent skidding in any weather. This surface never wears smooth, never accumulates a greasy surface film, and does not disintegrate. The advantages of tar as a road making or surfacing material may be summed-up as follows: Roads so made show economy in construction, are inexpensive to maintain and repair, are extremely durable, provide a permanent non-skid surface, and are dustless.

GAS WASH-BOILERS.

Domestic gas appliances did not figure largely in the exhibition, but J. Rowell & Son, of Newcastle-upon-Tyne, showed the "Leader" and the "Thermecon" gas-heated washing coppers. The "Leader" is complete with flue and copper condenser. The body is of strong galvanized steel sheets, and the pan is made from tinned copper sheets. The condenser is a copper dome pressing, and the burner is of the disc type. The "Thermecon" wash-boiler has a strong copper pan (heavily tinned inside) which lifts out, and a drip-proof lid which lifts-off and thus offers no obstruction when the copper is being filled with clothes, or when it is being emptied. The appliance is fitted with a "Thermecon" burner.

Contras to the Coal Subvention.

Regarding the coal subsidy, it is pointed out that the taxpayer must not regard it as so much expenditure without some compensation. There are vivid recollections of the millions that were wasted during the last great coal strike. We hope that will not recur. Meanwhile, there are for the taxpayer immediate compensations to the subsidy outlay. One result has been that the price of industrial coal has been lowered by something like 3s. per ton, giving a stimulus to industry and, in the case of the iron and steel industry, amounting to an indirect subsidy of 12s. per ton of steel manufactured. It has also had the effect of giving employment to many thousands of men who would otherwise have been drawing unemployment pay.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

AUTUMN GENERAL MEETING.

THE Autumn General Meeting of the Association was held last Thursday afternoon, in the Grand Hotel, Birmingham—Mr. W. E. CATON, of Oxford (the President), in the chair. A large attendance of members followed closely a paper on a subject of vital importance by Dr. T. Lewis Bailey, Chief Inspector of Alkali, &c., Works; and the subsequent valuable discussion was so lengthy that another item on the programme had to be left over until the next meeting.

LOSSES BY DEATH.

The PRESIDENT said that, before they started the business of the meeting, he regretted to have to report the death, since they were last together, of two members of the Association—Mr. H. Peaty, of Handsworth, who was an honorary member, and Mr. J. C. Bennett, of Bridgnorth. Both had regularly attended the meetings of the Association, and were highly respected by all. Letters of condolence, on behalf of the Association, had been sent to the respective families.

As a mark of their respect, the members stood silently.

The HON. SECRETARY (Mr. T. Thornton, of Rowley Regis) read apologies for absence, and the minutes of the Annual and the Spring Meetings.

NEW ORDINARY MEMBERS.

The following new members were balloted for, and subsequently declared to have been duly elected:

Mr. Robert Ewart Onions, Gas Manager, Alfreton.

Mr. Alfred Thomas Watson, Gas Manager, Rushden.

NEW HONORARY MEMBER.

The PRESIDENT said the Committee recommended that Mr. James Paterson, M.A., of Cheltenham, be elected an honorary member of the Association. It was not necessary for him to say anything to the members on behalf of Mr. Paterson; and he would therefore at once ask someone to propose his election.

Mr. W. S. MORLAND (Gloucester) remarked that it was a great pleasure to him to propose this. He had known Mr. Paterson practically all his life; and as he was an assistant with him (the speaker) for a number of years before he was in charge of a works, he knew that he was a worthy successor to his father as a member of the Association, of which Mr. Paterson, sen., was, he believed, one of the original founders, along with Mr. Charles Hunt and some others. The honour would be highly appreciated by Mr. Paterson.

Mr. J. FERGUSON BELL (Derby), seconding, said that Mr. Paterson had been President of the Association, and was intimately connected with the gas industry, as Secretary of the Midlands Employers' Federation. Those who had anything to do with that body knew how efficiently he discharged his duties. They had, possibly, less trouble with labour in the Midlands than in any other district; and this was due to some extent to the very able Secretary.

The resolution was carried unanimously.

PRESENTATION OF CERTIFICATES.

The PRESIDENT said they had with them that day three gentlemen whom they were very pleased to welcome—more especially owing to the reason for their presence. They had been successful in the Higher Grade Examination in Gas Engineering of the Institution of Gas Engineers, and he was sure he was only expressing the view of every member of the Association in declaring that they were very proud of them, and looked forward to each of them making a name for himself in the gas engineering profession. On behalf of the Institution of Gas Engineers, he had very great pleasure in presenting (along with the best wishes of all for their future success) the certificates they had won, to the following:

Mr. W. H. Perry, Upper Gornal, near Dudley.

Mr. Frank C. Sylvester, West Bromwich.

Mr. John H. Wainwright, Tipton.

OFFICERS FOR THE ENSUING YEAR.

It was announced that no nominations having been received by the Committee, they recommended the following as office bearers for the ensuing year:

President.—Mr. F. C. Briggs, of Dudley.

Vice-President.—Mr. W. G. S. Cranmer, of Willenhall.

New Members of Committee.—Messrs. A. S. Foster (Stourport), G. S. Eunson (Northampton), and T. H. Poulson (Stafford).

Hon. Auditors.—Messrs. C. M. D. Belton (Shrewsbury) and F. Lee (Hinckley).

Hon. Secretary and Treasurer.—Mr. T. Thornton, of Rowley Regis.

These recommendations were cordially approved by the meeting.

The PRESIDENT, in proposing Mr. Briggs as President, said he was a very energetic young man, and a regular attendant at the meetings.

Mr. C. M. D. BELTON (Shrewsbury) said it was gratifying to him to have an opportunity of seconding the resolution, because he did not think that a better choice could have been made. Mr. Briggs well deserved the honour.

Mr. BRIGGS said he regarded his election as an honour done to the junior members—the young men—of the profession, who held office in the smaller works. This being so, he hoped to make the Association even more useful to those young men than had been the case in the past, while at the same time endeavouring to follow worthily in the footsteps of the many eminent men who had preceded him.

EFFLUENTS FROM AMMONIA PLANTS.

Dr. T. Lewis Bailey, F.I.C. (Chief Inspector of Alkali, &c., Works), then read a paper on "Effluents from Ammonia Plants." This followed the lines of the one which he submitted to the Institution of Chemical Engineers at Leeds in July last; and it led to a long discussion, which is in type, but has had to be left over until next week.

METER REPAIRS AT GAS-WORKS.

Mr. Harold Davies (Chesterfield) had promised to open a discussion on "Meter Repairs at Gas-Works;" but the time for closing the proceedings having arrived, it was arranged that consideration of this matter should be adjourned to the next meeting.

SMOKELESS SOLID FUEL CONFERENCE.

By "OBSERVER."

In reviewing the proceedings at the Sheffield Coke Conference, one naturally asks one's self what purpose has been served, and to what extent the objectives of the organizers were attained. The meeting was representative of fuel technicians from all relevant industries. The gas and coking industries were also very fully represented through their managers and engineers.

It cannot be said that anything very new was evolved at the meeting, but most speakers dotted the "i's" and crossed the "t's" of the papers which were the basis of the discussion. Generally speaking, one would conclude that, having regard to the coke demonstration fires, and to the experience of various speakers, gas-works coke, if properly screened and comparatively dry, is an excellent material for all purposes of domestic use, with the exception of the open fire; and that even in this connection it may be entirely satisfactory in the larger fireplaces. It is only in the smaller fireplaces that any difficulty may occur in obtaining satisfactory results.

It may also be concluded that most speakers are of the opinion that there are great possibilities in connection with the blending of coals, and that combustibility does not depend on the amount of volatile matter left in the coke, but rather on the coke structure itself.

Many of the visitors to the meeting were astounded at the ease with which the coke could be lighted with paper and wood chips. Too little was heard of the form of firegrate which might be advocated for burning coke. This could, with advantage, be discussed further in Manchester on Feb. 19 next.

Apart altogether from the proceedings of the meeting, the exhibition and demonstrations provided by Prof. Wheeler and his staff most vividly impressed visitors with the enormous possibilities of research in connection with the whole matter. The lay mind has not yet grasped the idea that coke may be one of the most fruitful directions in which to prosecute research.

The slogans—if slogans are required—that might be evolved from the meetings might conceivably be in order as follows:

First—RESEARCH, RESEARCH, RESEARCH.

Secondly—QUENCH WELL, SCREEN WELL, BE ENTERPRISING IN SALES.

Lastly—RESEARCH, RESEARCH, RESEARCH.

WRITTEN CONTRIBUTIONS TO THE DISCUSSION.

DR. GEOFFREY WEYMAN.

One of the fundamental issues arising from the consideration of the production of smokeless fuel in the extremely important

papers (*b*) and (*d*) is concerned with the relation of the residual volatile matter to the combustible properties of the fuel. The point is of great practical importance because several workers have purposely framed methods of production in order to leave 5 to 10 p.ct. of volatile matter in the coke. This is to be deprecated, because such a fuel is not entirely smokeless; because, as Mr. Evans has pointed out, this residual volatile matter is potential gas and more valuable than the solid residue; and also because it means only a partial achievement of the ideal, which consists in separating the maximum amounts of gaseous and liquid products from coal. Moreover, there does not seem to be any reason to suppose that the residual volatile matter helps in any way in igniting a fuel. The temperature of combustion is always so high that the residual volatile matter is driven out in advance and, of course, in a direction away from the source of heat. Hence this volatile matter usually finds its way unburnt up the chimney, and cannot very well reduce the ignition range of the fuel.

The authors of paper (*d*) suggest that I have wrongly attempted to explain-away the obvious dependence of the observed ignition ranges on volatile contents of cokes. The figures on which this criticism is based, however, have relation only to cokes prepared in the same carbonizing plant (horizontal retorts). The figures given for cokes prepared in different ways show that this apparent relation is actually reversed. The explanation is not very difficult. Volatile matter is expelled by the effect of temperature over a period of time, and there are two factors—the temperature and the time. These factors are known also to affect the ignition ranges of the resultant coke. In current practice the relation of these two factors is more or less fixed by the rate of heat penetration into the charge.

The amount of residual volatile matter is therefore more or less an index of the temperature conditions, and likewise of the ignition range; but if this relation of time and temperature is altered—that is, if you expel your volatile matter either in less time or at a lower temperature, then the ignition range is remarkably reduced. If both factors are reduced, so much the better.

There appear to be strong reasons for supposing that the temperature factor is considerably more important in regard to the expulsion of volatile matter, but the time factor has a greater bearing on the rate of ignition of the coke. The mere reduction of temperature without disturbing the time-temperature relationship established by the very slow rate of penetration of heat into a charge—*i.e.*, simple low-temperature carbonization—does not give a markedly improved fuel, and in any case must be discarded as uneconomical. On the other hand, the authors of the papers (*b*) and (*d*) have described various methods of increasing the rate of heat penetration, involving blending, briquetting, the use of sensible heat of gases, and the agitation of the charge. Consequently the volatile matter even down to 2 to 3 p.ct. may be expelled in a shorter time. Fuels so prepared have remarkably low ignition ranges.

The blending briquetting method is of particular importance as applying to existing coke oven and gas-works plant. While there is no reason why the necessary plant should not be introduced into new gas-works or gas-works undergoing reconstruction, there is a great difficulty in placing such plant in established works. An appeal might be made to collieries, particularly those possessing several pits and working many different seams, to produce gas coals cleaned, blended, and briquetted. I might also point out that many gas-works use for steam raising and similar purposes the whole of the breeze made.

I would like to thank the authors of paper (*d*) for bringing to notice the elegant way of preparing coke sections. Such sections should be prepared by every coke producer, and kept as a record. When coke becomes more homogeneous, the examination can be extended by use of the microscope.

Finally, I would like to ask Mr. E. C. Evans and the members of the Conference if they will not accept the definitions of combustibility and reactivity given in paper (*d*). Personally, I object to the term "combustibility," because its literal meaning is "the percentage of combustible matter in a fuel;" but it has now come into wide use, and I can only suggest its being given an authoritative definition.

MR. E. F. KEABLE.

I should like to congratulate the authors of the papers read at Leeds, and also of those published in the Coke Competition issue of the "GAS JOURNAL." Matters concerning coke, both physical and technical, are exhaustively dealt with, and will ever form valuable works of reference. Speaking as one representing the relatively small gas undertakings (who, after all, form the majority, and are spread over a wide area), I feel that the problem is twofold—*i.e.*:

(1) How to prepare and market a thoroughly reliable smokeless fuel for public use, as in time to render the smoke nuisance a thing of the past; and to this end the papers before us are of extreme value. This will, however, take time.

(2) How to dispose of (at a fair price) the large stocks of coke to be met with almost everywhere.

To my mind, No. 2 is vital, for unless some selling plan is evolved which can become effective quickly with a minimum of expenditure, one cannot but fail to recognize the effect on the selling price of gas; and we as gas producers are aware that the electrical industry is already making capital out of the advances which have already been made. A perusal of the papers clearly points the way out as being via the domestic grate; and therefore the point really is, Which is the shortest route to attain this goal?

If we can once get stocks down, and maintain them in such a state, the many valuable suggestions which are contained in the papers will have a chance of receiving the attention they warrant. It is up to the larger undertakings to give a strong lead, by keeping their productions within their own areas. Otherwise the smaller concerns are going to be seriously affected financially. As one who had the pleasure to be of service in contributing to the competition, I should naturally like to have been in a position to read all that was written, with the view of discovering any schemes which had as their direct object the solution of the problem—*i.e.*, the rapid reduction of existing stocks. As these papers are not before us, it would be out of place for me to refer to my own paper.

Whatever be our outlook or methods in endeavouring to diminish our stocks, I think we should ever keep before us the facts that quality begets confidence, confidence begets enthusiasm, and enthusiasm can conquer even coke stocks.

MR. H. V. MITCHELL.

The writer's experience of low-temperature carbonization has led to the main conclusion that very special consideration must be given to any particular coal in order to devise a process that will be suited to its special character. The blending of coals entails some expense, and is obviously to be avoided if possible; and there are certainly many seams of coal in this country which, without blending, will lend themselves admirably to low-temperature processes. In all cases, the preliminary treatment of the coal by washing down to the lowest practicable ash percentage is vital to the burning quality of the semi-coke, and the drying of the washed slack by centrifugal or other means is an important matter from the points of thermal efficiency and bulk of liquor produced. A detailed study of the optimum temperature conditions is also essential; and here again, with most coals it may be necessary somewhat to compromise between the temperatures of maximum yield and the temperatures of minimum mechanical difficulty. Thus the writer has found that what appeared at first to be rather a formidable trouble, owing to stickiness in the retorts, could be overcome by slight temperature modification during one stage of the carbonization. Also, as any process will be commercially successful or otherwise according to the lifetime of the plant, careful control of the flue-gas composition is necessary; indicators for both CO_2 and CO being of prime importance. These should be direct-reading, of robust construction, with the least possible time-lag, and always in sight.

MR. P. C. POPE.

I add my quota of thanks to the authors of the papers which have been prepared for us. The general data and information contained in them are not only of very great interest and practical use to all concerned in the coking industry, but form a most useful guide to further research and investigation. My own experience in this connection has been confined entirely to low-temperature carbonization processes; and the object of such work as I have done has been to endeavour to produce, first, a semi-coke in the most suitable form for domestic purposes with a minimum of labour and capital cost; and, secondly, bye-products of the highest value that can be obtained without detriment to the coke.

From English coal (I am excepting cannels), the most important product of low-temperature carbonization from the commercial standpoint is coke—particularly if the coke is free-burning, readily ignitible, clean, dry, and strong. It is then saleable in the highest priced market as a smokeless household fuel. Such coke can be made from many English coals, which at the same time will yield valuable bye-products—tar, motor spirit, and gas—in commercial quantities.

I agree with the authors that the structure of the coke has a greater influence on the ease of ignition than the percentage of volatile matter; but I do consider it is essential that the low-temperature coke, if it is to be used for domestic purposes, should have at least 7 to 9 p.ct. of volatile matter left in it, for, if such coke is burnt in an open grate, the fire is cheerful and has a pleasing effect produced by the flame from the volatile matter present. With coke containing only 2 to 4 p.ct. of volatile matter, the cheerfulness associated with the domestic hearth is lacking. Further, if a reasonable amount of volatile is left in the coke, it is a much more suitable fuel for kitchen ranges where a top-heated oven is used. The necessity for the presence of this volatile matter is much more appreciated in Germany than in England; and in all the German plants I have seen they leave from 10 to 12 p.ct. of volatile in their coke, for this very reason.

I entirely agree with the authors that the presence of ash in

coal causes a serious reduction in the quantity of tar produced, as well as having detrimental effects on the quality and strength of the coke. This emphasizes the need for careful cleaning of the coal before carbonizing. It also indicates that those coals with a high percentage of contained ash, which cannot be removed by either washing or dry cleaning, will not be ideal for low-temperature carbonization when domestic fuel is the object in view. It further discounts one of the favourite themes of some of our Stock Exchange financial advisers—viz., that any old rubbishy coal for which at present there is no market will make a really good low-temperature coke. Coal for low-temperature carbonization needs as much care in selection as for high-temperature or gas-works processes. Coals which are really suitable for gas-works plants are generally far from ideal from the low-temperature carbonization point of view. Conversely, the ideal coal for low-temperature processes usually makes poor high-temperature coke, and gives too small a yield of gas for gas-works to be interested in it.

Referring for a moment to gas-works in relation to low-temperature carbonization, a large number of gas-works managers seem to be under the impression that low-temperature processes are intended to be their special enemy, and consider that, because the yield of gas from the low-temperature plant is much lower per ton of coal than from the high-temperature process, it cannot possibly serve any useful purpose. True, some low-temperature plants are designed with the object of producing a high yield of low calorific value gas, but plants of the stationary retort type are principally built for the production of solid domestic fuel, with gas as the lowest value bye-product. Such plants can make use of a portion of their gas for heating the retorts, instead of selling it, just as gas-works use a portion of their coke for heating their retorts. In other words, each process can efficiently utilize on its own plant a portion of its least valuable bye-product.

I said that the low-temperature plants can make use of a portion of their gas. The other portion can be readily separated commercially; and as it consists of liquifiable constituents such as olefines and high calorific value gases, it can by a simple process after purifying be compressed into steel bottles at 60 to 70 atmospheres pressure, and sold for use as an alternative to acetylene, being equal to the latter for all purposes. This gas is far safer to use and transport than acetylene, and even if sold at one-third or one-quarter of the price of dissolved acetylene, it would realize for the low-temperature plant a higher price than if the whole make of gas had been sold for ordinary lighting or heating purposes. But this is not competing with gas-works plant; and I cannot agree that low-temperature carbonization is a competitor of either gas-works or high-temperature coke ovens. The products are all different, and will have different markets and uses.

Mr. Evans refers to the blending of finely-ground coke breeze with the coal before carbonizing, as a means of strengthening the coke produced. This decidedly is so with certain classes of coal in stationary retorts, but not with all. Should, however, a percentage of the coke produced by the carbonizing plant be used for this purpose, it would entail a loss of throughput of the plant equal to the percentage of breeze added to the coal, and would consequently increase the over-all cost. Grinding the coal before carbonizing will also increase the strength of the coke, provided the coal used is not one of the highly expanding kinds. But if fine slacks—say, slack through ⅜ in. or ½ in. mesh—are used, and well packed in a stationary retort before carbonizing, the coke is as strong as that made from ground coal. If the retort is subject to a rapid and vigorous vibration while being filled with the washed slack, it will hold some 20 p.ct. more than if the coal is merely tipped in. At the same time, the strength of the coke is materially increased, as well as the throughput of the plant.

Briquetted coke, whether the briquettes are made before or after carbonization, is in the opinion of salesmen with whom I have discussed the matter a very doubtful "seller." They all agree that a good strong semi-coke which ignites easily and is reasonably free from ash, and clean to handle, will always be more attractive to the domestic market than briquettes in any form, no matter how much the briquette may be backed by scientific argument. In preparing a fuel for the domestic market one must seriously consider its appearance as well as its thermal value, if one wishes it to have a ready sale, bearing in mind that it is our wives who generally buy the household fuel, and they cannot resist the temptation of a clean and attractive appearance. After all, the object of carbonizing coal is ultimately to sell it, as otherwise the process is foredoomed to failure by being unable to give a satisfactory financial return on the capital invested.

COAL ASH AND CLEAN COAL.

By R. LESSING, PH.D.

Abstract of Second Cantor Lecture, delivered at the Royal Society of Arts on Monday, Nov. 30.

After discussing the dirt bands in bituminous coal—*i.e.*, layers of high-ash material deposited parallel to the bedding plane—Dr. Lessing referred to another extraneous impurity filling the cleat or cracks approximately at right angles to the bedding plane. This white substance is practically identical with the calcite or ankerite of the partings, and similar in composition to the material filling the pores of fusain in the same seams. The evidence so far available shows these compounds to be due to the infiltration of "hard" water into the cracks and fissures of the coal mass. Reference to the spontaneous combustion of coal and the prevention of explosions by stone dusting brought the lecturer to the preparation of coal for the market.

PREPARATION OF COAL FOR THE MARKET.

This consists almost entirely of the removal of mineral matter from the coal brought to bank, for even the sizing of coal by screening, in effect, brings about a differentiation in ash percentage, while the third operation—*i.e.*, the drying of washed coal—has as yet not been adopted in this country, except in isolated cases.

The removal of shale or dirt begins underground, for the collier is constrained under the existing system of working to load and send to the surface coal reasonably free from "dirt."

In considering the whole question of ash removal it should be remembered that the total truly inherent ash in the four coal components does not amount to more than 3 p.ct. in most coals; the clarain and vitrain fraction actually carrying only about 1·5 p.ct. Strictly speaking, that portion of the fusain and durain ash which is not derived from the original vegetable raw material may not deserve to be included. The bulk of the ash in the coal of commerce, which amounts to from 7 to 12 p.ct., and may rise to 20 p.ct. or more in the case of slack or other smalls, consists of adventitious impurities which are associated with the coal *in situ*—*i.e.*, roof, floor, and dirt bands, cleat and partings, consisting of calcite or ankerite, and of pyrites. These three classes of impurities form the "dirt," and though not constituting, as a rule, a large portion of the bulk, they contribute by far the preponderating percentage of ash to the total.

As a first step in the preparation for the market of coal which is not sold and shipped as "through-and-through" coal, it is screened for the purpose of separating the large coal, sizing the smaller lumps, and particularly for the removal of slack (duff, dross, dant, &c.), in which mineral matter is more concentrated. After screening, lumps of shale and pyritic rock are hand-picked by boys or women while the coal is travelling over picking belts.

As regards large coal, I have come to the conclusion that its higher market value is not due to its physical form, *qua* size, but to the buyer's unconscious knowledge that the fact of its remaining unbroken in the operations of mining, handling, and transport is a guarantee of its comparative freedom from ash. For the high ash in slack is mainly, if not entirely, due to the greater fragility and friability of the dirt bands and partings; and these or their fragments get concentrated in the smaller sizes. Hence the buyer's preference for large coal, which, once secured, he usually proceeds to break up before use.

On the other hand, the coal particles in the slack which are in mechanical admixture with the dirt are as free and perhaps freer from ash than the average lump of large coal of the same kind; and this fact forms the basis of all washing and cleaning processes.

The physical characteristics of the particles are of paramount importance in all flow washers. While coal particles approach cubical shape, shale occurs in flattened plates. In an upward current these plates tend to arrange themselves horizontally, and are borne by the water along with coal of the same size but smaller weight. Shale in the same position offers to a horizontal current of water a smaller cross-section, while coal particles offer a larger surface in the direction of the stream, and are thus carried further by reason of the difference in specific gravity and in physical shape. A close study of the "dirt" portion and its bearing on one or the other type of flow-washing is, therefore, very important.

WASHERY WATER.

A problem of considerable importance in connection with coal washing is the study of the water used in and discharged from the plants. This water has suspended in it in form of a slurry the finest coal particles, which comprise practically all the fusain contained in the coal. If the slurry, after settling out, is not returned to the clean coal, as is still frequently done, the latter should be clean in a literal sense of the word, inasmuch as it does not soil the fingers, while the slurry rich in fusain does. The examination of washery waters with a view to their clarification and purification before return into the washing cycle or discharge as effluents, offers a wide field for future research, and is closely bound up with the distribution of mineral matter over the various coal fractions.

DRYING OF WASHED COALS.

A disadvantage of all coal-washing processes is that the clean coal retains a considerable percentage of free moisture, which usually is about equal in weight to the dirt in the raw coal. By

this the fuel value is impaired and transport costs are not lowered. Of late, de-watering devices, mostly consisting of continuously working centrifugals, have been adopted to reduce the moisture content.

DRY-CLEANING OF COAL.

With the object of avoiding the introduction of moisture, methods for dry-cleaning of coal have been elaborated in America, where the freezing of washed slack during severe frosts is a further difficulty to be considered. The spiral separator is an apparatus largely used in the American anthracite field. It consists of a spiral inclined towards the centre post, down which the raw coal is allowed to slide. The combined differences in coefficient of friction and shape of particles cause the shale to maintain its course on the innermost track of the spiral, while the coal moves towards its outer edge into a flanged coal spiral, to be discharged separately from the shale.

A recent development also emanating from America is the adaptation of the ore-concentrating table for the cleaning of coal without the aid of water. The usual flow of water is replaced by a current of air blown through a flexible joint into a vibrating air chest, the top of which is covered by a permeable deck of woven wire cloth or perforated metal. The surface of this deck carries riffles arranged roughly across the direction of the jigging motion, by which the raw coal is moved forward; the angles from back to front and from side to side being adjustable. The coal fed on to the table is made more or less buoyant by the air passing upwards and through it, with the result that stratification takes place. The light coal particles are floated over the riffles and move towards the delivery chute; the heavier particles sink into the grooves formed by the riffles, and move along these towards the plant part beyond the end of the riffles. "Middlings" are able to jump the riffles near their end, where strength of vibration and angle of throw permit them to do so. By fixing cutting fingers at predeterminted points at the delivery end, the quality of the clean coal, middlings, and dirt can be adjusted.

An essential condition for a sharp separation by this method is the close sizing of the coal and the use of finely-adjusted tables for each size; this condition must probably be more strictly enforced in the case of air as a floating agent than where water is used. An experimental plant is now working in this country, and one of commercial size is in course of construction. The working results from these should be of great interest in view of the exclusion of added moisture from the cleaned coal.

COAL SAMPLING.

The problem of drawing representative samples for analysis of coal is intimately connected with the question of the mineral matter contained in it. The estimation of ash in consignments of coal is probably the most important item in its examination for commercial purposes. On account of the lack of homogeneity of its distribution, satisfactory sampling is a very difficult operation. As the ash percentage varies with the size of lump or particle, the ideal method of drawing samples would require that aliquot portions should be taken from each size according to its contribution to the bulk. This would involve, for example, where "through-and-through" coal is concerned, screening the whole consignment and quartering down each screening fraction, a proceeding which is obviously impracticable in the case of train loads or cargoes of several hundreds or thousands of tons. In view of the increasing importance attached to the ash content of coal, and the frequency of disputes arising particularly in the case of export coal, it is highly desirable that the scientific basis of proper sampling should be more definitely established. It is to be hoped that the efforts in this direction of the Committee on Sampling of the Fuel Research Board will be crowned with success.

CONTROL OF COAL WASHING AND CLEANING PROCESSES.

The various processes used or proposed for the improvement of the quality of coal depend on physical laws, the theory of which in many cases still remains somewhat obscure. The amount of truly scientific research done into these questions is very small compared with the values involved. A first requirement for improvements in the preparation of coal in general, and washing and cleaning processes in particular, is a more extensive and more efficient control of existing plants. Many of these are run without chemical control; in others, such control is of a casual and spasmodic character.

The principal method of controlling the work of a coal washery is to submit the products to float-and-sink tests, and to estimate the ash percentages in the fractions thus obtained. Attempts have been made from time to time to apply mathematical treatment to the results obtained, but generalizations as to the degree of washability of coals usually fail on account of insufficient knowledge of the kind, relative proportions, and distribution of the impurities.

As in work on the constitution of coal, radiography provides here again a useful means of adding to the information of those in charge of washing operations. The fractions obtained by float-and-sink separation in high-density solutions or the range of layers in the bed of a hand-jig, such as a Henry tube, are inspected with the aid of the "carbo-scope," or an X-ray photograph is taken.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Friday, Nov. 27, at the Westminster Technical Institute, under the presidency of Mr. W. L. WESTBROOK (North Middlesex Gas Company).

The CHAIRMAN said it gave him very great pleasure to welcome Mr. Townsend, of Colchester, who at one time was his Chief.

THE DAILY GRAPHS.

By W. W. TOWNSEND, of Colchester.

[The author discusses the problems dictated by the peak loads which have become prominent features of modern gas practice. In this connection types of gas-making plant and gas mixtures are compared, and the American method of supplying plain C.W.G. is commended. Flexibility is the essential. Mr. Townsend advocates a special tariff for long-hour use, because standing charges are nowadays so serious.]

When I was honoured with an invitation to address your Association on matters relating to both manufacture and distribution, my thoughts at once turned to the subject which I have tried to indicate in the title.

The line of development in the utilization of gas tends constantly to increase the peak load; and in many cases the chief centres of consumption are in the thickly-populated residential areas on the outskirts of the district. The fitting departments are hard at work fixing hundreds of gas fires, cookers, boilers, and industrial furnaces, leaving to the distribution engineer the problem of conveying the surging therms to the point of consumption as and when required, and to the works engineer the problem of meeting each day's demand without variation of quality.

The graphs to which I refer are of the daily and hourly deliveries of gas to the district—that is to say, the quantity—and in addition the charts showing calorific value, specific gravity, and pressure. As the variations in the volume required from hour to hour are now very great, it is most desirable that the distribution system should possess sufficient flexibility to enable it to meet the demand at all times with efficiency. In the manufacturing department the gasholders provide a reservoir without which it would be impossible for gas-works to supply the varying demand; but, even with this invaluable aid, sudden demands arise which tax the resources of the plant; and an increase in the flexibility of the manufacturing plant would be welcomed by all those who are responsible for the manufacture, and to whose resource and energy our consumers are indebted for the fact that very rarely does the gas supply fail. My theme on this occasion is, therefore, the desirability of flexibility in the manufacturing and distributing plant, coupled with rigidity in the standards of quality and pressure. In other words, let the output curve take what fantastic shapes it may, the ideal plant will respond with varying quantity, but unvarying calories.

The success with which the large undertakings have solved this problem is wonderful; and when you consider the varying loads of the London Companies, for instance, and the yearly reports of the official analysts, you must admit that their work is extremely efficient. The problem is being tackled in a variety of ways in different places, but the cost is considerable; and those responsible for the administration of gas undertakings should realize that gas is now used, in the main, for different purposes and in a manner different from what prevailed twenty years ago. This change has involved, and will lead to, considerable capital expenditure. In my own town, for instance, we sold to the War Office during the war years, through two large meters, 25 million c.ft. of gas per annum. When the War Office decided, as a national policy, to substitute electric lighting for gas, the consumption dropped to three millions—chiefly used in the Military Hospital. The consumption of gas in Colchester, in spite of this, has not fallen-off, but has shown each year a steady increase; but the 22 millions previously sold to the War Office in the centre of the district has been replaced by hundreds of separate consumers on the outskirts, to supply whom it has been necessary to spend a large amount of capital in new mains, meters, and stoves. Further, these new consumers all elect to have their meals, and their baths, at about the same time, and they have crowded their consumption into about two hours per day at the peaks of the load, whereas the War Office consumption was for lighting chiefly, and spread over several hours each day. The point I am trying to make is this—supposing our total output had remained stationary (it has not, as a matter of fact) capital expenditure would still have been necessary, because the gas is not sold to the same people for the same purpose. Take this illustration simply as an example, and remember that it is only one instance of the kind of thing which is happening.

Now consider the effect of putting on consumers in this way all round the district, and you will readily appreciate that, apart from the cost of the mains on the housing estates, there is the

problem of conveying the requisite quantities of gas through the existing mains, which were originally planned to deliver large amounts of gas not to the outskirts, but to the centre of the town. Is it not apparent that domestic consumption, though the backbone of our business, is an expensive service to us, when you take into account the cost of separate services, meters, stoves, &c., and the maintenance of these, and the short period of demand? People who expect to be able to switch on a geyser consuming (say) 120 c.ft. of gas per hour, at a point perhaps six miles from the works, at any time, should not expect their therms delivered to them in this handy form at the same price as if they took them home from the works in a gas bag. I sincerely trust that the Committee now sitting will recommend some scheme, which might be generally adopted, which will encourage the long-hour use of gas by a special tariff, because the principal cost is not the manufacture of the gas, but the standing charges, which are based on the maximum demand. Of this I am confident—that where industrial consumption can be obtained within easy reach of the trunk mains, it is a paying proposition to give a substantial discount for this long-hour load. With regard to lighting, the position has altered so much in the past few years that a discount might well be given for such consumption, in order to find more employment for the mains, which are not during the lighting hours working at anything like their full capacity—not because gas lighting has decreased (it is still an important part of the load), but because the cooking load is now so heavy.

Let us consider the question of flexibility, first as applying to the manufacturing plant. Water gas plant has great advantages from this point of view, and also reduces the amount of coke to be sold and the coal to be purchased; and for these reasons it is in fairly general use. Modern horizontal retorts working with heavy charges have many merits. The tar produced is liquid and gives no trouble, choked pipes are a rarity, and the system adapts itself to operation in two shifts of eight hours, leaving a gap of four hours between shifts when no charging takes place. These intervals allow time for repairs to the charging machine to be carried out in comfort; and naturally the labour costs are low. The drawbacks are that the units are large and the calorific value of the gas made varies considerably during the 24 hours. When a proportion of water gas is added, if this is blue or lightly carburetted, it is difficult to obtain a straight line on the recording calorimeter chart of the gas made. If, however, the practice of working into one holder and out of another is followed, and the gas is given time to mix, the law of diffusion of gases will operate, and the gas sent out will be the average of the whole make. That has been my experience for a number of years; and this point has a bearing on the questions we are considering. This averaging process cannot be carried out properly when the holders are nearly full, because this involves frequent changes from one holder to another, and there is not sufficient time for the gases to mix. Of course, a more even line can be attained if the charging of the retorts is spread over 24 hours, but this means the employment of an extra shift, and it then becomes a question of choosing between the cheapest therm and the easier way of working. Large works have the advantage of having a number of retort houses, and can arrange matters so that the charging of retorts is spread over the 24 hours. For a large number of works, however, one carbonizing plant suffices; and it is to these I refer.

As to the question of flexibility, a machine-charged horizontal setting is a large unit, and cannot be heated-up or let-down in a short time. The result is that, to meet the varying demands, (1) the weight of the charges may be varied slightly, leaving the carbonizing period unaltered; (2) the weight and the duration of the charge may both be altered; (3) the percentage addition of water gas may be changed. The first two methods have obvious limitations. The third is easily and quickly carried out, but tends to variation in the quality of gas.

Continuous vertical retorts have the great advantage of producing gas practically of the same calorific value throughout the day; but here again the size of the unit is large, and the desired flexibility limited. Also great care is necessary in heating-up a setting; and if extra gas is wanted in a hurry, few engineers would care to rush a vertical setting. The production may be varied within limits by altering the throughput; but this means readjustment of dampers, &c.

The Technical Press have drawn attention recently to a report of the Fuel Research Board (Technical Paper No. 14) on the "Enrichment of Coal Gas by the Injection of Gas Oil into Continuous Vertical Retorts." [An abstract was given in the "GAS JOURNAL" for Oct. 7, pp. 24, 37.] This is extremely interesting from many points of view, especially that which we are now discussing. It is shown, for example, that continuous verticals may be worked with 5 p.ct. of steam to produce 15,600 c.ft. of 518 B.Th.U. gas per ton, and that this may be increased, by steaming up to 20 p.ct. and adding 7·13 gallons of oil per ton of coal, to 18,180 c.ft. of 520 B.Th.U. gas—an increase of 16·5 p.ct. of therms with practically no change in calorific value. In practice, probably the larger make would be usual, which could conveniently be reduced during (say) the Easter holidays, and quickly resumed without any trouble when required. You will observe that, while this does give some of the flexibility required in one direction, it confines the engineer in another way. If he wishes to be able to increase his output by 16 p.ct. occasionally, he must tie himself to steaming normally only to 5 p.ct., which may be very uneconomical. Conversely, if he steams to 20 p.ct. normally, he can reduce his output occasionally, but cannot increase it. In countries like the United States, where in some cases the entire output of gas is carburetted water gas, the ideal of flexibility is reached; and it would be possible to supply from gasholders very small in proportion to the output. Here we have the ideals of unvarying quality coupled with flexibility of output in a form unapproached by any other type of gas-making plant.

When water gas is used, as in this country, simply as a diluent, a water gas plant is invaluable for its flexibility; but it can only be used within limits, because, of course, varying percentages of water gas involve varying composition of the gas supplied. I do not think that variation in the composition (within limits) is a serious practical difficulty, provided the calorific value of the gas sent out is regular. This is easier to obtain, with varying percentages of water gas, the nearer the latter approaches to coal gas in calorific value. In other words, it is easier to get an even quality by mixing varying amounts of a 550 gas and a 500 gas than a 550 and 300. For this reason, among others, I think a declared value of 500 is desirable where horizontal retorts are in use. Steamed verticals, of course, produce a lower calorific value, and in this case a lower standard is probably more economical, and both gases may be made at about 450 B.Th.U.

The difficulty about deciding on such a policy as this is the uncertainty of the future market price of gas oil. A good low-temperature process would enable gas undertakings to abandon the use of imported gas oil, and to spend some of the money instead on our home product coal. The rich gas produced would be used to enrich blue water gas to 450 or 500 B.Th.U., and the low-temperature coke would be put on the market. The plant would have to be specially designed, as the quantity of rich gas required would vary with the output of water gas each day.

The necessity for flexibility in the manufacturing plant is rendered greater by a second factor. Not only is the load subject to sudden fluctuations due to the increased use of gas for cooking and heating; but the gasholder storage has not in many cases been increased in proportion to the increase in the output. One reason for this is the fact that the increased yearly output has been obtained without any great increase in the maximum daily output. Another very important reason is the high capital cost of gasholders, and the fact that expenditure in this direction is unremunerative, while capital is needed for other purposes where its employment, either in improved plant, or additional mains and gas-consuming appliances, brings an immediate return.

Taking into consideration the fact to which I have referred—that, when the holders are nearly full, it is difficult to mix the gas produced—it will be seen that, with the increase in the heating load, flexibility in the manufacturing plant is greatly to be desired. I have heard, too, of holders which are not considered safe in a high wind when fully inflated; and in many works the top lifts of the holders, when uncupped, do not give sufficient pressure for the peak loads. This may lead to a state of things in which the engineer is afraid to fill his holders, and is unable to empty them. Thus the effective storage is very small. I shall no doubt be told that the remedies are obvious—make the holders safe to fill, and put in a booster so that they can be emptied. I agree, but there is a tendency to carry on with the existing arrangements till the eleventh hour, and to put off expenditure in these directions as long as possible.

Turning now to distribution of the gas, it will, I think, be admitted by all whose work lies in that department that what they would like would be, not a minimum of 2 in. pressure in every main, with probably twice as much during certain hours, but an unvarying 3 in. at every meter. This would enable them to adjust burners at any hour of the day, with the assurance that they would continue to function properly for a long time. This may seem an impossible ideal. With the present state of the streets in our large towns, mainlaying operations present ever-increasing difficulties. There is no one solution to meet every case, as no two districts are alike; but, if I may express a personal preference, it would be to make all the existing trunk mains into booster mains, carrying pressures running to 10 or 20 in. of water, not high-pressure measured in lbs. per sq. in.—though in certain cases, no doubt, new high-pressure feeder mains are the best solution. Of course, it would be necessary to put a governor in every branch main; and as most of these are fed from trunk mains at both ends, this would give very even pressures. Premises supplied direct from the booster mains would need individual governors, unless separate smaller mains existed in the same street.

Old distribution systems are at present sadly lacking in flexibility, and low-pressure distribution, as such, cannot successfully cope with the varying demand much longer, nor can we continue to increase the works pressure indefinitely, because this is bound to mean varying pressures in different parts of the district and at different periods of the day. I have dealt very imperfectly with the reflections inspired by the title. The industry is very much alive at the present time; and there is nothing less than a boom in gas appliance fixing. There is no pause. Problems continue to crowd on us; and the best

brains and efforts of all are required to meet the difficulties which lie before us. The object of this address is to impress the fact on this live and progressive Association.

Discussion.

The CHAIRMAN remarked that all would agree that they had listened to an extremely interesting address. Mr. Townsend had touched upon problems which confronted every gas undertaking. Speaking of his own district—that of the North Middlesex Gas Company—the works, fortunately, were situated at the centre of the area of supply; and they sent out gas along three distinct trunk lines to the thickly populated districts. To Mill Hill gas was sent at a pressure of 35 in. of water. It was boosted to East Finchley and to Hendon. In the latter case there was an 8-in. main 1¼ miles long. These supplies were, of course, supplemented by low-pressure mains. Pressures were so arranged that, at periods of maximum demand, there was 5 in. W.G. at distant parts of the district. He agreed with Mr. Townsend that it was desirable to have a pressure of 3 in. W.G. at the inlet to the meters. This was by no means too great, for they must bear in mind that there was a loss of probably ½ in. in the meter itself, and a further ½ in. in the run of pipe to the various appliances. A pressure of 2 in. at the appliance itself was an absolute minimum. The points raised by Mr. Townsend were pre-eminently practical ones. Each district had its own problems to face. In the North Middlesex area they were not troubled by great differences in altitude, and consequently the pressures were even. Speaking as a distribution man, Mr. Westbrook urged the necessity for maintaining a supply of gas of constant composition, in order to ensure the satisfaction of the consumer.

Mr. D. CLEAVE CROSS (Lea Bridge Gas Company) said that he had been impressed by the figure given by Mr. Townsend regarding the results obtained by the Fuel Research Board when steaming to the extent of 5 p.ct. It was stated that a yield of 518 gas of 15,600 c.ft. was obtained. This was equivalent to 81 therms per ton; and he felt sure that many who worked vertical retorts would be glad to reach this high figure, which, he thought, was rather impracticable. Mr. Townsend had very rightly stressed the desirability of having records in graph form of as many subjects as possible. These charts were extremely valuable and helped considerably in remedying faults which otherwise might pass unnoticed. At his works the pressures were recorded of the gas in one big main feeding the governors. By calibrating this in terms of hourly output it was possible to increase the pressure in this main to correspond to a definite demand on the district. By a study of charts relating to temperature and consumption, it was an easy matter to increase the pressure by an amount which would give the extra volume of gas required by a decrease in temperature. In this way the pressures on the district could be nicely regulated in the event of (say) a cold spell. The holder question to which Mr. Townsend had referred was very interesting. The method of working into one holder and supplying from another was ideal, but often impracticable. He thought that, if the inlet and outlet pipes of a holder were at least 60° apart—and preferably more—the gas sent out would be sufficiently constant in quality. At Lea Bridge the inlet and outlet pipes were 60° apart, and the mixture sent out did not vary more than 1 p.ct. in 24 hours. Of course, in his case he had the advantage of working vertical retorts. Mr. Cleave Cross concluded his remarks by thanking Mr. Townsend for his highly interesting paper.

Mr. A. BROADBENT (Senior Vice-President) suggested that the main problem of the works engineer was to make a gas of constant composition, and that of the distribution engineer to supply the gas at an adequate and unvarying pressure. Mr. Townsend had referred to the question of capital expenditure and return on new business, and rightly said that the cost of giving service to domestic consumers was great in comparison with other business. Thus, said Mr. Broadbent, it was highly desirable to reach saturation point in the premises of existing consumers. It would pay gas undertakings to give greater attention to industrial load, as the variation in manufacturers' demand was not so great. With regard to charts, he was sure that the hourly output records were extremely valuable.

Mr. F. J. PEARCE (North Middlesex Gas Company) said he was a firm believer in graphs; and any works not equipped with recording instruments lacked a great deal of efficiency. Mr. Townsend had referred to the method of working a horizontal retort house in two shifts. He (the speaker) did not like the system. It had been tried two or three years ago at Mill Hill. It was true that the labour costs were somewhat reduced, but so also was the thermal yield. Mr. Pearce drew attention to the recording gravitometer, which, he said, was a sensitive instrument and told at once if there was anything wrong in the retort house. The President had given them some figures relating to the pressures in the North Middlesex area. He might say that on Sunday, Nov. 22, out of a 24-hour output of 2,100,000 c.ft., no less than 500,000 to 600,000 c.ft. was required during the dinner hours from 11 to 2, and of this amount 50 p.ct. was needed from 12 o'clock to 1 o'clock. This clearly showed the necessity for having a large boosting plant.

Mr. E. E. CALVERT (Gas Light and Coke Company) remarked that charts indicated the working of the plant during the night-time, and were very valuable on this account. He agreed with Mr. Pearce that with two-shift working there was a loss in thermal yield, and that it was difficult to maintain an even calorific value. He asked Mr. Townsend what percentage of inerts he had in his gas, and what means he had of controlling the vacuum in the retort house as the quantity and quality of the gas made were reduced. Also, did he work his water gas plant on the two-shift principle?

Mr. J. H. GOLDSMITH (Hon. Secretary) remarked that Mr. Townsend had suggested making use of the existing low-pressure distribution system, and having high-pressure or semi-high-pressure main feeders, fitting governors on the branch mains. This would entail a large number of governors or feeder mains. Would it not be cheaper to lay new high-pressure mains? He asked if Mr. Townsend had any experience of the Widlake controller. The South Suburban Gas Company had found them very satisfactory during the past two years.

Mr. W. R. MOGER (Tottenham District Light, Heat, and Power Company) asked Mr. Townsend what type of governor he used. He (the speaker) thought that a pressure of 3 in. at the inlet of the meters was ideal, but did not agree with the idea of having governors on every service.

Mr. TOWNSEND, replying to the discussion, remarked that in his paper he had outlined an extreme case. His point was that low-pressure distribution was unsatisfactory, and resort had been made to boosting. Where were they going to end? There was no finality about the subject, and each district must work out its own salvation. Mr. Cross had referred to the results published in the report of the Fuel Research Board which dealt with the enrichment of coal gas by injecting oil into the retorts. The results, he pointed out, had been obtained from Mitchell Main coal, which was a very good one. Even without injecting oil, but on the introduction of a water-cooled tube, the calorific value of the gas had been raised, though the yield had been reduced. Possibly the peculiar conditions existing had something to do with the yield. The report was a valuable one, and he advised members of the Association to read it. He was glad to hear that Mr. Cross and other speakers agreed as to the value of charts, and in particular hourly charts. Regarding the method of calibration suggested by Mr. Cross, he would mention that in a paper read before the Eastern Counties Association by Mr. J. F. Simpson on Sept. 23 (see "JOURNAL" for Sept. 30) reference was made to a self-loading governor. As the output increased, the bell of this governor dropped, and automatically increased the pressure. This, of course, was not a cure for lack of pressure; and if the low-pressure mains were inadequate to deal with the demand, gas must be boosted into them at some point. He agreed with Mr. Cross that a good deal could be done by arranging the inlet and outlet pipes of holders; but he (the speaker) preferred two small holders to one large one. It was interesting to hear from Mr. Pearce and Mr. Calvert that they did not favour the two-shift system. If, when a three-shift method of working was adopted, the charging periods were changed also—say, from 12 hours to 10 hours—this fact must be taken into account. Duration of charge and the number of shifts were two distinct problems, and must not be confused. Mr. Calvert inquired about the percentage of inerts in the gas. This varied from 12 to 16 p.ct. The vacuum on the retorts was controlled by a retort-house governor. Anti-dips were used; and they regularly obtained a yield of 70 therms per ton of coal carbonized. The water gas plant, like the coal gas installation, was worked on two 8-hour shifts. In a large works it was, of course, better to run the water gas plant continuously; but on a small works it paid best to economize in labour, which was a major charge. If the output was great, then the plant was run continuously on the usual three-shift system. The governors used were Peebles mercurial type. Replying to Mr. Goldsmith's point as to the expense of fitting numerous governors on branch mains, he agreed that the cost was considerable. But the cost of laying and maintaining a high-pressure main in congested thoroughfares was also very expensive; and it was necessary to consider every possible alternative. Each case should be worked-out individually, for no general solution could be found. With regard to the Widlake pressure recorder, he had no experience of this instrument. He had no doubt, however, that it was useful in certain districts, and that it was a handy and ingenious device.

VOTE OF THANKS.

Mr. W. GROGONO (Gas Light and Coke Company) proposed a vote of thanks to Mr. Townsend for his paper. It seemed to have been assumed, he said, that graphs related to the charts from recording instruments. Why not extend the usefulness of this method of visualizing results by plotting graphs of the inerts in the gas, the oil used weekly, and so on. If they did this, they would be able to see at a glance what was happening. Mr. Grogono said that he had tried working the two-shift system for three years, but had abandoned it. The saving in labour costs was really very small. He certainly preferred 12-hour charges on the three-shift system. When working two shifts, the water content and the amount of free carbon in the tar increased, and it was difficult to keep a level gauge on the retorts. Mr. Townsend had mentioned that the inerts in his gas were 16 p.ct. It was difficult to keep the percentage of inerts low when there was a 4-hour gap between the shifts. A question of importance was that of peak loads. In 1880 the hourly consumption of gas was small until dark, when it rose to a high figure for about three hours, and then fell down again. To-day there was a medium figure till breakfast, when the consumption increased considerably, then a lull till the dinner hour, when there was another peak. A smaller peak occurred in the afternoon at tea-time, and then there was the evening load. The consumption curve was, in fact, tending to flatten-out. If the temperature, barometer, and consumption charts were plotted and compared, they would yield useful information.

Mr. J. K. GRANT (South Suburban Gas Company) seconded the vote; and Mr. Townsend's reply terminated the meeting.

Electrical Ladies.—Activity reigns in the ranks of the Electrical Association for Women. Some fifty of the members have lately been to a big furniture emporium in the Tottenham Court Road, where they heard a lecture on the use of electricity for lighting, cooking, and washing, with special reference to lighting designs in connection with furniture, vases, and other ornaments, and concealed lighting to give "brilliant sunshine and sunset effects." No doubt the ladies were much in love with the sunshine and sunset effects. Electrical sunset effects sometimes end in (as the daily newspaper reporter would say) "cimmerian" effects, when the generating station or something on the district refuses to function properly.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Visit to Kirkintilloch Gas-Works.

On Saturday, Nov. 21, the Western Juniors travelled to Kirkintilloch on the invitation of the Town Council, and inspected the gas-works. Owing to a dense fog surrounding Glasgow and district, many members were prevented from being present; but between forty and fifty attended, and spent a very profitable afternoon.

The party were received by Provost SHANKS, who extended a cordial welcome to the visitors. He said that the fact that they were able to sell gas at 2s. 2d. per 1000 c.ft. was much appreciated by the community. He felt that with such a result, and the works maintained in the efficient manner which was to be seen, the public had every reason to be satisfied.

The company were formed into four parties and conducted round the works by Mr. James Dickson (Manager) and his staff. Mr. Robert Gray, this year's President, who at one time was Assistant at Kirkintilloch, conducted one party.

THE WORKS.

When the present works were opened in 1908, the output of gas was 62 millions per annum. This year the output will be not less than 140 million c.ft., or 630,000 therms. The method of gas manufacture in operation is the dual process of producing straight coal gas and then diluting with water gas. In February, 1922, a Humphreys & Glasgow water gas plant was installed, having a capacity of 360,000 c.ft. per day. This has been in constant use since that time, and has given great satisfaction. The transformation that this plant has created in the works is indicated when it is mentioned that the retort bench, which consists of twelve ovens with eight retorts in each setting, was originally built for an output of 500,000 c.ft. per day, but at present, though the average output is 514,000 c.ft., there are only five ovens in use.

The yield of straight coal gas per ton of coal is over 9000 c.ft. of a calorific value of 600 B.Th.U. or slightly over. This is then diluted with water gas so as to give a gas that will meet the prescribed standard of 450 B.Th.U. The combined yield of gas per ton of coal carbonized is steadily maintained around 20,000 c.ft. The settings in use have been rebuilt with segmental silica retorts. The regenerators and furnaces have also been remodelled and rebuilt from the ground level.

In the engine room was to be seen a Waller rotary compressor, which was feeding the extreme ends of the supply area. This machine has a capacity of 15,000 c.ft. per hour, working against 5 lbs. pressure. Here was also housed a rotary meter for the measurement of the water gas previous to its entry into the foul main, where it joins with the coal gas.

Some years ago a large C. & W. Walker scrubbing machine was converted into an ordinary tower scrubber, having been dismantled and re-erected so that its functions as a washer might precede that of a small Holmes scrubber, which is now used as a catch for any ammonia that may escape forward. About two years ago there was installed at the inlet of the tower scrubber a "P. & A." tar extractor. In the purifier house, foundations were being laid for an additional box to be erected by Messrs. Clapham Bros. An oxide breaker, driven by a gas engine, was recently installed here.

In the sulphate of ammonia house, the plant has been rearranged since it was first erected; a new Taylor saturator having replaced the original one. A centrifugal dryer has been installed, with the object of improving the mechanical condition of the salt. From what was seen, this end is being achieved. An analysis of the salt, representing the quality sent out from the works recently, shows:

Nitrogen	20·9 p.ct.
Ammonia	25·41 ,,
Water	0·94 ,,
Free acid	0·27 ,,

A Hird tar dehydrating plant, erected by W. C. Holmes & Co. during 1919, was next inspected. The capacity of this plant is 12 tons per day. In the workshop buildings was to be seen a well-fitted machine shop with gas engine, turning lathe, screwing machine, vertical drill, and polishing and grinding machines. The building is also equipped for light smithy work. In the general store a section of the building has been set aside for carrying-out meter repairs. Since the establishment of this branch a few years ago, all meter repairs have been effected at the works.

After the company had inspected the works, they were entertained at tea, following which they made their way to the gas showrooms.

GAS SHOWROOMS.

The property outside and inside has been newly decorated, and presents a very attractive appearance. Over the entrance door is a large automatic sign with suitable wording, advertising gas. In addition were two 5-light "Littleton" lamps. These, including the sign, are operated mechanically by clocks; the lighting and extinguishing being controlled so as to operate after the premises are closed. In the front shop a fine display of gas fittings was shown, mounted with decorative globes and shades, which gave a very pleasing effect. Gas fires, &c., were also in evidence. In the back portion of the showrooms, a kitchen set, consisting of a "New World" cooker and a "Nautilus" coke boiler, with a cream-tiled surround, made a fine domestic display. In this part of the building, hot-water appliances and cooking apparatus were shown.

The work of this branch has been singularly successful during the past three years; and in the last financial year no less than 555 additional appliances were installed—gas fires accounting for the greater part of this number. The number of pendants, lamps, burners, mantles, and glass sold from the showroom has been most satisfactory.

VOTE OF THANKS.

At the conclusion of the visit, Mr. ROBERT GRAY expressed on behalf of those present their thanks for the opportunity to inspect the plant at Kirkintilloch. The Western District, he said, had a special interest in the town. In 1908, Mr. James McLeod, a Past-President, was in charge of its gas affairs. Mr. James Bell, another Past-President, was Manager in 1912; and to-day still another Past-President, in the person of Mr. Dickson. Notwithstanding the occasional comment that horizontal retorts were ancient, they had that afternoon seen in Kirkintilloch a gas supply drawn from horizontal retorts sold to the public at the extremely low figure of 2s. 2d. per 1000 c.ft. He had no doubt the works would progress under the able management of Mr. Dickson. Mr. Gray proposed thanks for the welcome, and also to the guides who had so courteously conducted the party round the works.

Mr. JAMES DICKSON expressed his pleasure at receiving at Kirkintilloch his old friends in the Junior movement. He said that it was the motive of the Council of Kirkintilloch to do their very best for the community; and in selling gas at an average rate of 5·7d. per therm they were trying in a fair way to help the people in their area. Recently they had inaugurated a free maintenance scheme, and he had high hopes that this would prove of great benefit to the consumers. He hoped that the members would profit by the time spent at their works.

FORTHCOMING ENGAGEMENTS.

Dec. 5.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to Alloa. Paper by Mr. W. Scott.

Dec. 5.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Meeting at Glasgow. Paper by Mr. R. Keillor, of Greenock, on "Surplus Heat."

Dec. 5.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Stockport Gas-Works. Adjourned discussion on Mr. T. R. Cook's paper on "Purification."

Dec. 5.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Cardiff. Papers by Mr. G. H. G. Hughes, on "Gas Engines;" and by Mr. R. J. Williams, on "Tar for Roads."

Dec. 7.—ROYAL SOCIETY OF ARTS.—Cantor Lecture (third and final) by Dr. R. Lessing on "Coal Ash and Clean Coal."

Dec. 8.—CENTRAL EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL.—Meeting.

Dec. 8.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Dec. 9.—INSTITUTION OF CHEMICAL ENGINEERS.—Meeting at Burlington House. Paper by Col. B. I. Rolling, D.S.O., on "Magnetic Separation."

Dec. 10.—MURDOCH LODGE.—Meeting.

Dec. 12.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of the Hornsey Gas Company.

Dec. 12.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Bradford. Paper by Mr. J. W. Wood, M.Sc., on "Aeration of Burners."

Dec. 18.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute.

INSTITUTION OF GAS ENGINEERS.

Dec. 8.—4 p.m., Advisory Committee on Education.
Dec. 9.—11.30 a.m., Emergency. 12.30 p.m., Finance.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Low-Temperature Carbonization.

SIR,—In view of the diverse opinions as to the valuations of the products resulting from low-temperature carbonization, I feel that no useful purpose would be served by my replying in detail to the criticisms that have appeared in the "JOURNAL;" and I will merely content myself with saying that the values placed upon the products by me can be justified by the actual experience of some of the larger gas undertakings in the Kingdom.

I observe that one of your correspondents is a Director of Low-Temperature Carbonisation, Ltd.; and it seems to me, therefore, that it afforded an opportunity for giving the gas industry some results based upon actual experience of the process of low-temperature carbonization on a commercial scale, in the same way as the results of gas undertakings are published in their annual accounts. I assume that Mr. N. G. Thwaites will have at his command the figures for the complete working of a period of twelve months, and if he will kindly give the full results, stating the quantity and cost of the coal carbonized and the quantity and net return of the products produced, together with the costs of operation and maintenance of the works, the figures could be compared with the data furnished by me, in which case it would be possible to see in what direction the low-temperature process is able to be so successfully carried out as to produce the very large percentage of profit claimed by your correspondent.

I think I may say here that the whole of the gas industry will be particularly interested to find that coal suitable for the manufacture of coke of a good quality can be purchased at such a low figure as 10s. per ton, and will also earnestly hope that a sufficient quantity may be available to satisfy the whole of their requirements.

D. MILNE WATSON.

The Gas Light and Coke Company,
Horseferry Road,
Westminster, S.W. 1,
Nov. 30, 1925.

SIR,—As was to be expected, the much-debated question of the low-temperature carbonization of coal *versus* the present methods of high-temperature carbonization has occupied the attention of the Commission; and a definite opinion adverse to low-temperature methods was given by Mr. D. Milne Watson, the Governor of the Gas Light and Coke Company.

Quoting from the "Times" report of the meeting of the Commission on Nov. 5, Mr. Watson was understood to state that he had sent an engineer to Germany to ascertain what was happening there regarding the low-temperature carbonization of coal, and that the opinions given by various German experts to his emissary were to the effect that the results obtained from the low-temperature trial plants had ceased to interest the scientific world in Germany. These are grave words coming from a gentleman occupying the distinguished position of Mr. Milne Watson, and naturally made a serious impression on the Commission.

So far as the matter not interesting the scientific world of Germany, I beg to suggest to Mr. Milne Watson, and incidentally with all respect to the members of the Commission, that he and they should read a recent series of three articles published in that excellent weekly journal the "Iron and Coal Trades Review" on July 24 (No. 2095), July 31 (No. 2996), and Aug. 7 (No. 2997). These articles were prepared for the "Iron and Coal Trades Review" by Dr. Fr. Schütz and Dr. W. Buschman, and through the enterprise of the Proprietors and the Manager of the Review, Mr. Harold Jeans, were translated into very nice English. The articles are written with the meticulous care and moderation one is accustomed to expect from German scientists, and explain in full detail the operation of the Fellner-Ziegler low-temperature retort installed by the General Coal Utilization Company of Berlin-Siemenstadt ("Alkog").

The opening paragraph in the articles is worthy of notice, as indicating the clear view the Germans entertain of low-temperature carbonizing processes. It may be quoted:

"It is, of course, obvious that a low-temperature carbonizing process cannot be employed in connection with any and every kind of fuel, and that a very careful selection must be made in this respect . . . it is precisely in this respect that negligence has often been shown in the past few years; and many failures which have brought the low-temperature carbonization process into disfavour in wide circles are attributable to this circumstance."

Further, the paragraph states:

"In the first place, those low-grade fuels are to come into the processes which have not hitherto found a satisfactory market—viz., small coal of every description which has a large content of volatile matter. In such cases the low-temperature carbonization process is capable of showing specially satisfactory economic results where, in the production of a smokeless fuel, it aims at the following objects: The recovery of valuable liquid and gaseous bye-products with the simultaneous improvement of the low-grade initial material into a high-grade fuel by means of giving it a more suitable shape and increasing its calorific value."

Regarding Mr. Milne Watson's remarks that low-temperature carbonization is only suited for particular ranges of coal, it must be pointed out that the same remark applies to gas-works, as there is perhaps no industry so particular—if one may except the metallurgical coke industry—as to the coal it purchases as is the gas industry. Unfortunately these are the coals which it is believed will first give out, and will become dearer and dearer and more difficult to obtain as time goes on. On the other hand there is a much larger range of other coals suitable for low-temperature carbonization, which the gas companies could not economically use.

Besides the Fellner-Ziegler process, there are installed respectively at Mulheim and Gelsenkirchen the Stinnes plant in the one town and the Thyssen plant in the other, which plants the writer is led to believe are working satisfactorily and economically. One point about these plants is the enormous throughput of coal per diem, ranging from 50 to 150 tons per retort, whereas our best high-temperature vertical retorts cannot accomplish more than 3 tons or thereabouts. That our leading gas companies and our leading technical gas publications are not very sympathetic towards schemes of low-temperature carbonization, the writer has realized for a long time; and in consequence the usual upshot will be that the Germans will show us the way, as they did in the dye industry.

At any rate the low-temperature men—and they are not by any means confined to this country—need not despair, as Autolycus can take his wares to another market. As Dr. Lessing stated to the Commission (see Report "Iron and Coal Trades Review," Nov. 6, No. 3010), "*If low-temperature carbonization were developed alongside of the electrical industry, there would be a better chance for it. It would enable the gas to be used under the best conditions,* and there was not the slightest reason why the Companies should not erect a gas retort house containing high and low temperature carbonization plant, and dispose of the two streams in conjunction with electric supply and for ordinary purposes."

Again, take Sir Richard Redmayne's (late Chief Inspector of Mines) address last week, at the Working Men's College, St. Pancras, on the "Coal Industry":

"In regard to future developments, he advocated super electric power stations which, in conjunction with low-temperature carbonization, would reduce the working costs of collieries and increase the demand for coal."

These words in conjunction with Dr. Lessing's remarks concerning the development of low-temperature carbonization alongside of the electrical industry are especially apposite at the present moment, as on Jan. 26 to 29, 1926, there is to be held in Chicago, U.S.A., a mass conference of The American Institute of Electrical Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the National Electric Light Association, the National Safety Council, and the Western Society of Engineers, co-operating in a large technical meeting to be known as the "Mid-West Power Conference," whose object will be to present the trends of engineering development and research in the form of a number of technical papers.

The Consulting Engineer of the great Fuller-Lehigh Steel Company, of Fullerton, U.S.A., New York, Hamburg, Paris, and Spain, Mr. H. W. Brooks, is to contribute a paper on "Low-Temperature Carbonization," and has done the writer the honour to invite his co-operation in preparing the paper, and, if it can be managed, his presence at the meeting.

Regarding the alliance of electricity production in bulk and low-temperature carbonization, this has already been anticipated by that enterprising and far-seeing captain of industry, Sir Hugo Hirst, Bart., Chairman of the General Electric Company, who some years ago collaborated with the writer and the late Mr. C. H. Wordingham, a Past-President of the Institution of Electrical Engineers, in preparing plans for the electrification of East Kent, embracing the whole enclave from Dover to Margate, including a supply of electricity to the Channel tunnel whenever the same may be constructed, that portion of the Southern Railway running through East Kent, and the entire group of Kent collieries.

The centre of operations was to have been Richborough, where land had been acquired; the electricity being produced by the low-temperature carbonization of Kent coal, which, when subjected to many tests by the writer and his associates, yielded exceedingly good results—especially the Tilmanstone and Snowdon coals, these giving some 20 gallons of tar oils and 16 cwt. of a first-class low-temperature smokeless fuel per ton of coal treated.

The time, however, was not propitious, but the plans, estimates, &c., are all in existence; and the time will assuredly arrive when this far-reaching enterprise becomes a reality.

F. D. MARSHALL.

19, *Queen Anne Chambers,*
Westminster, S.W. 1,
Nov. 30, 1925.

Conference on Smokeless Fuel at Sheffield.

SIR,—This conference was called for discussion of the above subject; and it was therefore disappointing that, at the outset, all discussion of low-temperature carbonization was "taboo." In my view, this very much minimized the value of the conference, as it limited discussion to high-temperature work, which up to now has certainly not produced any fuel for domestic purposes so suitable as that produced by low-temperature processes. It seemed to me that in this part of the subject (high-temperature carbonization) there was a distinct paucity of progress reported; and at the end of the meeting one was left with the feeling that very little had been heard that was new.

One speaker remarked that the open fire was only a part of the household uses of smokeless fuel, and therefore high-temperature coke covered most of the ground. But let there be no mistake on this point—there are few households which will be bothered with more than one kind of fuel; the great majority, indeed, operating only one fire. Therefore, if raw fuel is to be effectively replaced, it must be by one suitable for all purposes.

I hold no brief for low-temperature carbonization from the point of view of replacing present methods of gas production, but am nevertheless a believer in it for the special purpose of smokeless fuel and oil production. Moreover, I hold the definite view that it can be operated on a sound commercial basis. Consequently I hoped there

would be considerable discussion of this subject, from which much could be learned. I was therefore more surprised when one gentleman made a remark to the effect that the conference was assisting at the obsequies of low-temperature carbonization, and I was reminded of the case lately reported in the Press, in which a certain Mr. Yates had been presumed to be dead and the Court had empowered the administration of his estate, whereas shortly afterwards he was found to be very much alive and perfectly capable of looking after his own affairs.

This letter, Sir, is intended, however, to urge the great importance of summoning another conference (preferably in London) which will make its special subject the production of solid smokeless fuel and oils by low-temperature carbonization; and as I hold the opinion that there is no need for rivalry between low-temperature and high-temperature processes, but that there is ample room for both, and that, furthermore, they will in the future be both working on a large scale (though not necessarily in the same places), I trust that all prejudice on the part of the devotees of the high-temperature process will be eliminated, and thus enable careful consideration of the subject by all parties interested in carbonization at whatever temperature, no matter whether they be consumers or suppliers of fuel.

Gas-works (according to all experience up to date) should produce gas in the midst of, or near, the community being supplied, whereas smokeless fuel works can be situated at or near the collieries, and consequently are able to choose such cheap fuels as they require. Hence I see no reason whatever for rivalry.

ARTHUR H. LYMN,
Consulting Chemical and Gas Engineer.

40, *Westminster Palace Gardens, S.W.* 1,
Nov. 24, 1925.

SIR,—I notice in your report of my remarks at the Conference on Smokeless Solid Fuel at Sheffield on Friday, Nov. 20, I am reported as having said that fuel suitable for domestic purposes could not be made in continuous vertical retorts even though a low ash content coal was selected. This is entirely opposite to what I said; and the remainder of your report is not quite in accordance with my statements.

In order to make the matter clear, I give below a copy of the notes which I prepared just before the meeting:

It was suggested in many of the papers that only coal should be bought with a certain ash content, but it would be very difficult to have all the 18 million tons of coal that were bought annually for gas-making purposes with low ash content. The best policy, in my opinion, would be to use the low ash coals for making coke for domestic purposes. If these coals were carbonized in continuous vertical retorts, a very satisfactory fuel would be produced. Coals with higher ash content would produce a suitable coke for central heating and commercial purposes if it was made fairly dense. The ordinary coals which were suitable for gas making had a range of from 8 to 12 p.ct. of ash. I am pleased to say, however, that recent experience showed the ash content is coming down. My figures have been decidedly better on the average during the last year or two.

I have also been misquoted in my remarks relating to the Coke Competition, the 15th to 18th line of which should read:

The absence of any outstanding papers in Sections I. and II. from gas engineers, was to be regretted, and he could only hope, &c., &c.

W. B. LEECH, Engineer.

Gas-Works, Beckton,
Nov. 30, 1925.

Coke for Household Heating.

SIR,—My connection with the coke-oven industry for the past twenty years naturally makes me interested in the use of coke; and I am surprised to hear at conferences, and to read in technical journals, how little is known of the possibilities of the uses of coke for household purposes.

For over ten years I have been burning mixed coke dust and breeze in a cooking range. This fuel is stored in the open; and the moisture is often as high as 20 p.ct. In winter, a stove placed in the hall—a large one—uses the same fuel. This stove is in continuous operation, and requires very little attention. It is filled-up each night, and keeps-in until the next morning. The heat from this stove is felt in the bedrooms and in the other rooms where there are no fires. I have used the more expensive screened broken coke, from coke ovens; but I find the small quite suitable.

H. CERCKEL.

The Red House,
Mansfield Road, Alfreton,
Nov. 30, 1925.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The Draft Special Orders proposed to be made by the Board of Trade under Section 10 of the Gas Regulation Act, on the applications of the Hornsey Gas Company, Lea Bridge District Gas Company, Leigh Corporation, and the Port Talbot Corporation, were laid before the House, and referred to a Special Orders Committee.

Campbeltown Harbour and Gas Order Confirmation Bill.

A Bill to confirm a Provisional Order relating to Campbeltown Harbour and Gas was presented on Nov. 24 by the Lord Balfour of Burleigh, and read the first time.

HOUSE OF COMMONS.

Low-Temperature Carbonization.

Mr. SMITHERS asked the Secretary of Mines whether he could inform the House what steps had been taken to make the process known as the low-temperature carbonization of coal a commercial success, and with what results.

Colonel LANE-FOX, in his reply, drew attention to the reports for 1924-25 of the Committee for Scientific and Industrial Research and the Fuel Research Board. He said a great deal of research had been, and is being, undertaken at H.M. Fuel Research Station, and an offer had been made to test, free of charge, plants which claim to have solved the problem of low-temperature carbonization. Promising results had been obtained in a number of cases; but so far as he knew no plant had yet been working on a commercial scale for a long enough period to enable any definite judgment to be formed.

Employment in the Gas Mantle Industry.

Replying to Capt. Peter Macdonald, who desired to know how many persons were employed in the gas mantle industry, Sir A. STEEL-MAITLAND stated that figures were not available.

NORTHAMPTON GAS ORDER.

House of Lords Committee—Thursday, Nov. 19.

(*Before the* MARQUIS OF BATH (*Chairman*), *Earl* LUCAN, *Lord* RAGLAN, *Lord* TERRINGTON, *and Lord* SPENCER.)

The Board of Trade Order, under section 10 of the Gas Regulation Act, to enable the Northampton Gas Light Company to increase their area of supply, came before a Committee of the House of Lords on Thursday, Nov. 19, for consideration of the petition by the Northamptonshire County Council for protective clauses with respect to the construction and improvement of roads and bridges. The main point at issue was the contention of the County Council that if, for the purpose of widening roads, the Gas Company's mains had to be shifted, the cost should be borne by the Company.

The question was first considered when an inquiry was held by Mr. H. C. Honey (then Director of Gas Administration) on March 30 (see "JOURNAL" for April 8, p. 132), but no clause was then inserted for the protection of the County Council. In the course of that inquiry it was stated that the Board were not prepared to make alterations of the general law and apply them to particular cases in the absence of agreement between the parties, unless there were special circumstances. It was also stated, on behalf of the County Council, that there were no special circumstances in this case. At a later stage the matter was raised before the Special Orders Committee of the House of Lords. Application was then made for a further inquiry, and the Committee recommended in favour of this course (see "JOURNAL" for Aug. 5, p. 341). The present proceedings were the outcome of this recommendation.

The Company were represented on Thursday by Mr. W. E. Tyldesley Jones, K.C., and Mr. Jacques Abady, and the County Council by Sir Lynden Macassey, K.C., and Mr. Rowand Harker.

At the commencement of the proceedings it was pointed out by the Chairman of the Committee that Lord Spencer was a member of the Northamptonshire County Council. He suggested, therefore, that Counsel should open the case, and that Lord Spencer should retire after the opening.

Mr. TYLDESLEY JONES said that the Gas Company had no objection whatever to Lord Spencer sitting on the Committee. The course suggested by the Chairman was adopted, however.

Mr. TYLDESLEY JONES, opening the case for the Gas Company, said that the Order came before the Committee as an approved Order which the Board of Trade desired to make if confirmed by both Houses of Parliament. The object was to extend the area of supply to include various parishes in the County of Northampton, the inhabitants of which had expressed a desire for a supply of gas. At present the Company had powers to supply in the County Borough of Northampton and in 51 parishes or parts of parishes in the County. It was proposed to add another 24 parishes or parts of parishes, and there was no objection to this extension.

Referring to the County Council's application for special protection with regard to roads and bridges, he said their point was that the Gas-Works (Clauses) Act was passed in 1847, and that, in view of the altered conditions with regard to roads since that time, its provisions were inadequate. Therefore, they asked for special protection. They also said that in a large number of cases special clauses for the protection of County Councils had been granted. It was true that in Private Acts there were a large number of special protective clauses; but in the majority of cases they were inserted by agreement between the parties. Gas undertakers had over and over again agreed to give some moderate relief to County Councils, with a view to getting rid of the opposition to their Acts or Orders, because this opposition entailed expense. The Northampton Gas Light Company would also have been willing to do so for similar

reasons in this case, but they could not concede what was asked for by the Northamptonshire County Council.

Continuing, Counsel said that, if the 1847 Act were out of date, as suggested, and the whole matter required reconsideration, it should be dealt with by General Act, and should apply to gas undertakings generally. His case was that in the present Order the Gas Company sought to incorporate the ordinary code, as laid down by the 1847 Act, and that this was sufficient. The mere fact that other people in other cases had been willing to get rid of opponents by making concessions, could not be used as a measure of the reasonableness or otherwise of making concessions. The County Council, in the present case, raised some questions of very great importance, which had been raised by petitioners on previous occasions, and which had been disallowed time and time again by Committees of both Houses of Parliament.

It was often said, when these matters were dealt with, that on the one hand there was the public, represented by a County Council, and, on the other, a profit-making company. The position to-day was, strictly, that a gas company was providing a public service. Gas or water was just as much a necessity to the life of the community as the ability to drive about in a motor car, and the interests of the gas consumers could not be subordinated to the interests of the road users. If extra burdens were placed upon the Gas Company, the price of gas to the consumers had to be increased; and to throw a burden upon the gas consumers was merely to relieve the people who used the roads. If it were found that alterations were required in the mode of maintenance of roads, or in the form of width of roads, in order that road users might have a better or wider surface to conduct their racing experiments upon, or for other purposes for which the roads were used, was it right that, in order to relieve the users of the road, the users of gas should pay more? It was really a contest, not between a profit-making company and a public authority, but a contest between the road user and the gas user. To-day that gas was really vital to the ordinary public; and many of the vital services of the country were being provided at a much greater expense than formerly, because of the burdens placed upon the undertakings performing those services. One could not put burdens on undertakings performing public services without ultimately imposing those burdens upon the consumers. The main roads in the County were used very largely by people from outside the County, so that this contest was largely one between the local people who consumed gas and those from outside the County who used the roads. The road users should bear the expense of the improvements they required.

Referring to the suggestion that the provisions of the Gas-Works (Clauses) Act of 1847 were inadequate, he said that the County Council came into existence in 1888, so that for 37 years the Company had worked with the County Council under this code, and there had been no difficulty of any kind. Also, it was expressly disclaimed at the Board of Trade inquiry in March that there was anything special in the case of this County. At the time of the Board of Trade inquiry, Mr. Honey had said that the general view of the Board on these clauses was that, in the absence of agreement, they would make no alteration of the general law, which ought to apply to all classes of undertakers who had power to break-up roads. What the County Council were asking the Board to do was to make an alteration in the general law applicable to a single undertaking, and to put them under statutory conditions different from any other undertaking of the same kind in the County. This, said Counsel, was the official view of the Board of Trade.

Sir LYNDEN MACASSEY said that this was the view against which the County Council were appealing to the Committee.

Mr. TYLDESLEY JONES remarked that, if there were to be an alteration in the general law, it ought to be done by general legislation; it was not right to force special provisions on an individual company.

Referring to a statement in the petition that the provisions of the Order and the existing law did not make adequate provision with regard to the depth or position of mains in roads, Counsel challenged it. He agreed that time after time gas companies had acquiesced to clauses being put into Bills providing that they should deliver a plan showing the exact position of the main they proposed to lay. Apparently those clauses were inserted by people who were ignorant of the fact that the existing general law already provided for it.

As to the suggestion that the Company's mains and pipes might be so laid that it would become impossible for the County Council, in carrying out their statutory duties, to avoid causing injury to them, in respect of which the Company might claim compensation, Counsel said that, if the Company laid their mains in accordance with a plan approved by the County Council, then the pipes were properly there; and if they were injured, the Company should receive compensation.

With regard to the moving of pipes when road improvements were being carried out, Counsel said the position of the general law was that the cost of moving the pipes must be borne by the authority carrying out the improvements. It was now sought to alter this; and one of the provisions which the County Council would want to impose upon the Gas Company—*i.e.*, on the local gas consumers—was that they should bear the expense of doing the work which was required, in order that people might be able to pass through Northampton more easily. Was this fair? Were the Committee going to make an alteration in the general law simply in the interests of the Road Fund, as regards one-half of the cost of improvement of the road, and, as regards the other half, in the interests of the ratepayers of the County as a whole? The Company were ratepayers, and the consumers were ratepayers too; and why should the ratepayers who were gas consumers bear an extra burden in order to relieve the county ratepayers generally and the Road Fund?

Continuing, Counsel said there was a hint in the petition that the County Council wished to limit the length of road which could be taken up at one time by the Company when laying mains; but this, he said, would add to the cost of laying the mains, and would involve delay.

It was pointed out in the petition that modern methods of road repair and improvement might render it possible for damage to be caused to mains, for which the Company might claim compensation; and provisions were asked for preventing the County Council from being held liable. Counsel said that, if pipes had been properly laid according to a plan approved by the County Council, the latter should not be entitled to damage the Company's pipes and pay them nothing for it. It was also asked that more than three days' notice should be given to the County Council by the Company before carrying-out works. The latter were quite willing that the statutory notice should be increased.

There were a number of other matters raised, in regard to which protection was asked for; but Counsel said that some of these were covered by the existing code. One matter, however, was that the Company should pay costs due to the concentration of traffic arising out of their operations. Counsel said that a concentration of traffic clause might have been agreed to sometimes; but he did not think it had ever been imposed upon undertakers after a fight, and he asked the Committee not to impose it upon the Company. With regard to indemnity for damage caused by the bursting of mains, he said that, if the County Council were at liberty to do as they liked with the roads, they themselves might burst the mains and ask the Company to pay for the damage; and, as far as he knew, a clause such as was now asked for had never been given. The County Council also asked to be enabled to carry out the reinstatement of roads, after gas mains had been laid, at the cost of the Company. Counsel said that reinstatement was now carried out by the latter, and they objected to the work being taken out of their hands. There had not yet been any complaint or difficulty in this connection.

It was suggested that the protection now asked for should apply not merely to operations carried out under the powers of the present Order, but also in regard to future operations under existing powers in relation to the existing area of supply within the County.

Col. G. S. EUNSON (Engineer and Manager to the Company), in evidence, said there had been no difficulty whatever with the County Council with regard to the laying of mains or breaking-up of roads. The supply of gas to the parishes in respect of which power was now sought meant laying long mains, and the Company could not afford to supply those parishes if the laying of mains was made an expensive matter. If he were limited to taking up lengths of only 100 yards of road at a time, it would affect the speed at which mains could be laid, and increase the cost to such an extent that the Company would not be able to supply to the new parishes. In the County roads the mains were laid under the grass verge at the side; and if the roads were widened, the verge would be brought into the carriage-way, which might mean an alteration of the position of the mains. In the whole of the 40 years during which he had been connected with the Company, he had never had to go to the Justices to settle a dispute with the County Council as to the laying of mains.

Sir LYNDEN MACASSEY, in cross-examination, said that the National Gas Council were taking an interest in this case, and suggested that an amicable arrangement would probably have been arrived at between the Company and the County Council if the National Gas Council had not intervened.

Witness said he did not think so.

COUNSEL suggested that the possibility of alteration of mains was an ordinary contingent when laying mains in a road to-day.

Witness remarked that the County authorities would say that they wanted them put in a certain position they had in mind, very often, and the Company put them in to their specification.

COUNSEL said that the primary purpose of a road was to carry traffic, and the road was improved for the purposes of traffic. He suggested it was fair, therefore, that the cost of altering the mains for the purposes of that improvement should be borne by the Company.

Witness did not agree.

COUNSEL then referred to a statement by Mr. Tyldesley Jones, to the effect that the Northampton Electric Light Company, in 1923 and 1924, had obtained power to supply the parishes which the Gas Company were now asking to supply, and there were no provisions in their Orders imposing upon the Electric Light Company the obligation to remove their mains when a road was improved. Sir Lynden produced a copy of conditions which had been imposed by the County Council upon the Electric Light Company, under the provisions of the Electric Lighting (Clauses) Act, 1899, which Act entitled the County Council to make conditions, there being a right to appeal to the Ministry of Transport in case of disagreement. One of the conditions was to the effect that, if the position of the Electric Light Company's mains had to be altered in consequence of road improvements, the Company should bear the expense. He asked why, if it were necessary for an electricity company to pay for the cost of alterations, it was not equally right for the Gas Company to pay.

Witness said he had been told distinctly that the Electric Light Company did not pay. In reply to further questions, he said he did not see any distinction between a gas and an electricity company in this respect.

On the question of the notice to be given to the County Council when the Gas Company contemplated carrying out works, Counsel said he wanted fourteen days instead of three. Mr. Tyldesley Jones said this was a small matter, and he would concede it, except as regards service pipes, where three days were sufficient.

As to the length of road which could be broken-up at a time, witness saw no necessity for any restriction, because it was a matter which could be arranged always with the County Surveyor, and the Company were always prepared to meet him in any special case.

Asked why he objected to the reinstatement of roads being carried out by the County Council, he said it was because the expense would be greater than if carried out by the Company.

Sir LYNDEN MACASSEY said that surely the County Council had more knowledge and experience of these matters than the Gas Company.

Witness said he was not sure.

The CHAIRMAN said that surely the County Council had power to have the roads restored to their own satisfaction.

COUNSEL agreed, but said that this was a question of doing the work themselves. The County Council had an expert staff and personnel who did nothing else but look after the maintenance and improvement of main roads.

Witness said that the County Council had always been satisfied with the reinstatements carried out by the Company.

Mr. TYLDESLEY JONES then referred to the conditions imposed upon the Electric Light Company, that they should pay the cost of altering the position of their mains in the case of road improvements. If this Company had assented to certain conditions, then it was by reason of their acceptance of the conditions that they became liable. In a section of the Electric Lighting (Clauses) Act other than that referred to, however, it was provided that, if a road authority required the position of electric mains to be altered, the road authority had to bear the expense. The condition imposed upon the Electric Light Company in this case was contrary to that provision.

Sir LYNDEN MACASSEY said that the County Council had the right to prescribe conditions; and if an electric lighting company were dissatisfied with those conditions they could appeal to the Ministry of Transport. These conditions had been approved by the Ministry.

Mr. TYLDESLEY JONES expressed the opinion that it was doubtful whether the condition referred to was a legal one; and if it were not within the ambit of the section of the Act to which he had referred (laying it down that the expense of alterations must be borne by the road authority), then there was power to go to the Courts and get it declared *ultra vires* and illegal.

Sir LYNDEN MACASSEY said that the conditions were appealed against by the Electric Light Company to the Ministry of Transport within the last six months, and were settled in the form stated.

Mr. TYLDESLEY JONES remarked that there had been several cases in which public departments had purported to do things under the words of an Act, and the Courts had held that they had no power to do them—including the Ministry of Transport. Therefore, the mere fact that the Ministry did approve these conditions was no test at all.

Sir LYNDEN MACASSEY said he hoped the Committee would assume, in the absence of evidence to the contrary, that what the Ministry had done they had done properly, and within the limit of their powers.

Mr. TYLDESLEY JONES hoped the Committee would not.

Sir LYNDEN MACASSEY then referred to the conference now taking place between the County Councils' Association and the representatives of public utility companies, including the National Gas Council, with a view to arriving at a decision with regard to protective clauses to apply generally as to the laying of mains. If the Gas Company would agree to hold up this Special Order until the conference had arrived at a decision, he was prepared to accept that decision, whatever it might be, and to agree to the insertion of a clause in accordance with it.

Mr. TYLDESLEY JONES said he could not consent to holding-up the Order, because it would delay the supply of gas in the extended area of the Company. The conference was not likely to come to a conclusion, if it came to one at all, for a long time. The same suggestion had been made at the Board of Trade inquiry, but the Board had said that they could not have the Order held up.

Sir LYNDEN MACASSEY said he could not help thinking that some course might be devised which would enable them to obviate prejudicing the work of the conference. If the present Committee gave a decision, it would prejudice this work.

Mr. *William Cash* (Vice-Chairman of the Central Executive Committee of the National Gas Council, and Chairman of a number of gas companies) gave evidence. His companies, he said, worked in amicable relationship with the local authorities.

Questions were put with regard to specifying the depth below the surface at which mains should be laid, but Mr. Rowand Harker (for the County Council) said they would not ask that a particular depth should be specified.

With regard to diversions and widenings of roads, Mr. Cash said that the line always adopted by his companies was that in those cases the local authorities had no right to divert or disturb the mains, but if they wished to do so it was a matter for their expense. He would not say that in some cases they had not agreed, where it was considered to be equally to the advantage of the companies that the mains should be diverted, to contribute to the cost; but on the question of principle he regarded the matter as vital. If it were necessary to carry out a work of public improvement, and, for the purpose of that improvement, to divert a main which had been properly laid, and laid with statutory authority, that diversion was part of the cost of the public work, and, therefore, should form part of the charge borne by the promoters or undertakers of that public work. If, for instance, as had occurred in connection with big widenings and diversions of roads, private property had been interfered with, or a house had been demolished, no one had ever suggested that the owner of the house or a piece of land which was taken should contribute the value of the house or land to the public work; and why a water or gas company, whose mains were there with statutory authority, properly laid, with the approval of the proper authority, should be asked to contribute to the cost of the public work, he failed to see.

Mr. ROWAND HARKER, cross-examining, asked whether, if the Committee considered there was a doubt as to the legal right of the road authority either to alter the position of a main or to require the Company to do so, in the event of an improvement of the road being carried out, Mr. Cash would think it unreasonable for the County Council to ask for a clause making it clear that they had that right—apart from the question of cost.

Witness said he thought it most unreasonable. If it was a right which was in doubt, let them test it at law.

COUNSEL asked whether, in a case where it was essential that a main should be moved for the purpose of carrying out a public improvement, Mr. Cash would consider that the County Council or road authority should have the right to insist upon the main being moved.

Witness said he did not mind their having the right, if they would pay for it.

The Committee adjourned until Friday.

Friday, Nov. 20.

Sir LYNDEN MACASSEY addressed the Committee, on behalf of the County Council. The case the Council presented was that, when the Gas-Works (Clauses) Act of 1847 was passed, the conditions of traffic on roads were absolutely embryonic as compared with conditions of the present time, and the Act did not afford the degree of protection which the present conditions demanded.

The CHAIRMAN asked whether this did not point to the desirability of a new Gas-Works (Clauses) Act, to apply generally.

COUNSEL said it did not. The Act had been referred to as the "general law," but he ventured to think that this was a misnomer. An undertaker could adopt all, or none, or any number, of the provisions of the 1847 Act, and these provisions had not the slightest legal effect unless and until they were incorporated in a special Bill or Order. He objected altogether to the case being made, therefore, that the Act was in the nature of a Public General Act which had compelling force, and which applied, of itself, to all gas undertakings.

Mr. TYLDESLEY JONES remarked that he had not made that point.

Sir LYNDEN MACASSEY said he was not suggesting that he had. Continuing, he said there had been scores of special protective clauses given to road authorities by gas companies, increasing in number and amplitude in recent years. It would not do to say that these clauses were agreed by the companies in order to get rid of opposition. They were conceded by the most important gas undertakings, company and municipal, in the country, and, if they had thought they were improper clauses to concede, they had only to have the issue tried before Parliament. Therefore, he did not think the Committee would disregard them. The Lord Chairman, also, was not in the habit of allowing the insertion of clauses, even if agreed, if they were not proper. He ventured to suggest with the greatest confidence that the inference to be drawn from this large and growing mass of agreed clauses, varying the provisions of the 1847 Act, was that that Act was inapplicable to modern conditions, and required amendment in various respects. Parliament was always ready to deal with a case in which the general law was found to be insufficient, and would make the necessary amendment if a case were made out for amendment.

If roads were primarily required for the purposes of traffic, and mains had been laid in those roads, surely the use of the roads for the reception of those mains was a secondary and subsidiary purpose. If, in order to meet the growing needs of traffic, the roads had to be widened and improved, surely, on first principles, the cost of removing the mains, where necessary, should be borne by the owners of the mains. If the laying of mains in a road to-day were attended with the reasonable probability that they would need to be moved in the case of widening the road, to meet the increasing needs of traffic, was it fair that the ratepayers, and the Road Fund, should bear the cost of removing these mains? Was it fair that a gas company should be subsidized by the ratepayers?

If his suggestion to hold-up the present Order until a decision had been come to on this question by the conference referred to had been adopted, it would have been a happy solution, because it would have avoided a decision having to be given by the Committee on a somewhat cursory and partial view of an important question. As his suggestion had not been accepted, however, he asked the Committee to allow the insertion in this Order of a clause granted by the House of Lords in 1921, in the Sunderland and South Shields Water Company's Act, for the protection of the Durham County Council. The Water Works (Clauses) Act contained provisions for the breaking-up of streets, which were practically the same as those in the Gas-Works (Clauses) Act, but the Durham County Council urged that those provisions did not meet adequately present-day conditions. After a full discussion of the matter, the Committee presided over by the late Lord Ribblesdale had allowed the clause which he now asked should be inserted in the Northampton Gas Company's Order. This, he believed, was the only case since the war when the question was contested before Parliament, and there had been any number of agreed clauses in subsequent Acts and Orders following on the lines of the Sunderland clause. The clause provided, among other things, that 14 days' notice should be given to the County Council of works to be carried out by the Gas Company. There was a limit of 100 yards to the length of trench which could be opened, if there were not room for two carts to pass one another; and in the event of improvements of roads, the Company were to alter the position of their mains, as necessary, at their own expense. The Council were not to be liable in respect of damage to the Company's mains arising from the use of steam rollers up to 20 tons, except in case of negligence, and the Company were to pay compensation for damage sustained by the County Council in consequence of the failure of any of their mains or works. Differences were to be settled by arbitration.

Sir Lynden Macassey also offered to undertake that, if and when the conference previously referred to came to a decision upon the wording of a clause applicable generally, this agreed clause should be substituted for the Sunderland clause he now asked for. He did not ask that the code which applied to the existing mains of the Gas Company should be altered, but merely that the Committee should apply the clause he now suggested to mains to be laid in future, both in the existing area of supply and the new area to be added by this Order.

Lord TERRINGTON said he did not think it could be applied to existing mains.

Mr. TYLDESLEY JONES, addressing the Committee, referred to the evidence given in 1921 in connection with the clause in the Sunder-

land Act, and said that the discussion upon this important question of principle was not by any means adequate. Further, the evidence showed that there were special circumstances applying in that case, and the clause was asked for on those grounds. Therefore, it was not a precedent. On the other hand, the matter had been discussed over and over again before the war, when many of the points conceded by Lord Ribblesdale's Committee in 1921 had been threshed out and had been decided consistently in favour of the gas or water companies concerned. The clause in the Sunderland Act represented the high-water mark of the demands which the county councils had ever made; and if the Committee conceded it in this case, they would concede to them everything which the county councils and the public utility companies were now discussing. He asked the Committee to exercise their judgment on this matter. In every single case where the matter had been fought, with the exception of Sunderland, committees had decided that the cost of altering the positions of mains when road improvements were carried out should be borne by those carrying out the improvements. This was the decision in the case of the Brighton & Hove Gas Company's Act of 1910, the Tamworth Gas Company's Act of 1911, the Kidsgrove Gas Company's Act of 1914, and the Liverpool Gas Company's Act of 1914.

Mr. R. F. PARKER (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agent) asked what was the decision in the case of the Eastbourne Gas Company in 1909.

Mr. TYLDESLEY JONES said the Company had conceded the point in connection with a bridge, but in other respects it was fought, and the decision was in favour of the Company. Referring to the conditions imposed upon the Northampton Electric Light Company on this question, he said he had received information from the Ministry of Transport that the Company had withdrawn their appeal, without prejudice to future action. Thus it was clear that there was not a decision of the Ministry that those conditions were proper ones to impose; and the appeal was never heard. He asked the Committee to decide this question on its merits, and to give some guidance to the conference, because, when there was a body of gentlemen discussing a vital question on which they held different views, they might discuss it for some time, and come to no decision. If the Committee decided it, it would be some guidance to the conference. On its merits, he submitted that the Gas Company's case was unanswerable—that if the alterations of roads were to be carried out in the interests of public traffic generally, then they ought to be carried out at the public expense, and that the unfortunate gas consumer ought not to be made to pay a higher price for his gas in order that wider roads might be provided.

After consulting privately, the Committee decided that the Order should be allowed to proceed in its present form, with the exception of the concession which the Company had made—namely, that the notice to be given to the County Council by the Company before carrying out works should be given 14 days before the work was to be commenced, instead of 3 days, as laid down by the Gas-Works (Clauses) Act. This, however, did not apply to the laying of service pipes.

NOTICES GIVEN OF BILLS (SESSION 1926) RELATING TO GAS, &c., UNDERTAKINGS.

Notice has been published of the intention to promote in the 1926 Session of Parliament the following Bills containing clauses having reference to gas undertakings.

Ascot District Gas and Electricity Company.—The Company are seeking power to raise additional capital both for gas and electricity purposes, and to make conditions as to the supply of gas.

Barnet District Gas and Water Company.—The Company are promoting a Bill dealing with both branches of their undertaking. They desire to make new provisions with regard to the price or prices (differential or otherwise) which they may charge for gas; to have power to supply in any part of their limits gas made at any of their works; to alter and define the method of raising further capital; to establish special purposes and renewal funds; and to make various regulations governing the supply of gas. The Bill will contain clauses relating to co-partnership or profit-sharing, and to the holding of meetings of the Company.

Chorley Corporation.—One part of a Bill to be promoted by the Corporation will relate to their gas undertaking. They will ask for the limits to be defined within which they are authorized to supply gas, and for further powers to be conferred upon them, including provisions with regard to the supply and price of gas. There will also be clauses requiring coke to be sold by weight or measure, and with reference to financial matters.

Darwen Corporation.—The Corporation desire to have further powers conferred upon them in connection with their gas undertaking, including the sale and letting for hire of gas fittings and apparatus. They will seek extension of their financial powers.

Gas Light and Coke Company.—The Company give notice of their intention to promote a Bill to empower them to raise additional money by borrowing on mortgage or the creation and issue of debentures or debenture stock (redeemable or irredeemable); to provide that the existing and future stocks and debenture stocks of the Company shall be transferable in amounts of one pound or multiples thereof; to increase the amount chargeable for copies of the shareholders' address book; to provide for the giving of indemnities in respect of lost or destroyed debentures, mortgage bonds, certificates, or warrants; to repeal section 36 of their Act of 1909 and to amend section 9 of their Act of 1903; to authorize the payment of dividends on the ordinary stock of the Company up to a specified rate, notwithstanding section 34 of the Company's Act of 1909; to amend that section with reference to dividends payable on the 3½ p.ct. maximum stock of the Company; and to repeal the powers of creating and issuing ordinary or preference stock for certain purposes conferred by the Company's Act of 1925.

Halifax Corporation.—Among various other matters, the Corporation will seek, by a Bill to be promoted, further powers in connection with their gas undertaking—including provisions as to calorific power, pressure, price, and obligation to supply gas, size and materials of pipes and fittings, repair of piping, &c., in dangerous condition, &c. The Corporation will also seek to extend their financial powers.

Horley District Gas Company.—The Company will bring in a Bill relating to the supply by them of electricity in scheduled areas, and the erection of a generating station and works on the existing gas lands of the Company. There will be provisions for changing the name of the Company, for the raising of further capital, and for the keeping of separate accounts.

London County Council.—Among the principal subject matters of a General Powers Bill of which the Council give notice is: "To prohibit the sale of coal containing an undue proportion of slate or slack or incombustible matter, and to confer powers upon the Council and their employees with reference thereto."

Mynyddislwyn Urban District Council.—Included in a Bill of which the Council give notice will be further provisions and powers with reference to their gas undertaking—*i.e.*, prices, minimum payments, and bulk supplies.

Newcastle-upon-Tyne Corporation.—In an Omnibus Bill, the Corporation propose to make provisions to regulate the sale of coke delivered by means of vehicles, or exposed for sale from vehicles, and to impose obligations and restrictions upon the sellers of coke and rights and powers upon the purchasers thereof, and to prescribe penalties for failure to comply with the intended provisions or any requirement made thereunder.

Swindon Corporation.—In a Bill for general purposes to be introduced by the Corporation will be clauses for the adoption of the Sale of Gas Acts, 1859 and 1866, and the recovery of compensation for injury to lamps.

PROVISIONAL ORDER.

Dundee Corporation.—The Corporation are applying to the Secretary for Scotland for a Provisional Order to dissolve the Gas Commissioners and to constitute the Corporation as the Authority for carrying the Dundee Gas Acts into execution, to empower them to issue redeemable stock, &c.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 25.]

Nos. 28,792-29,466.

BERGIUS, F.—"Process of obtaining hydrogenation gas." No. 28,873.

BOYS, C. V.—"Means for sampling and delivery of gas." No. 28,985.

LEVERICK, F.—"Reversing valves for controlling direction of flow of fluids." No. 29,301.

LEWIS, G. P.—"Treatment of solid carbonaceous matters to obtain organic compounds, &c." No. 29,371.

SIMS, A. G.—"Ascension pipes for gas retorts, and seals therefor." No. 29,357.

STEWART, J. G.—"Gas-analysis apparatus." No. 29,398.

TARRY, G.—"Liquid measuring meter." No. 29,453.

THOMPSON, F. S. & H. J.—See Leverick, F. No. 29,301.

TRADE, BOARD OF.—See Boys, C. V. No. 28,985.

Derbyshire Gas Company Fined.

At Eckington, the Whitwell and District Gas Company were summoned by the Derbyshire County Council for supplying gas below the required calorific value. Mr. W. H. Skinner, who prosecuted, said in 1921 the Company obtained an Order, and gave notice that they would supply gas at 500 B.Th.U., which standard they were required to maintain. The Company could allow the standard to fall to 475 B.Th.U. without liability; but for every complete 5 B.Th.U. less than that, they were subject to a penalty of £5. Mr. John White (the County Gas Examiner) made two tests of the gas on Sept. 10, and found that the calorific value for the day averaged 459·75 B.Th.U.; so that the Company were liable to a maximum penalty of £15. Mr. Skinner explained that the Company had the right to appeal against the certificate of the Gas Examiner; but the defendants had not done so. Also, if they could prove that the deficiency in the calorific value was due to circumstances outside their control, they would not be liable to a penalty. In the present case, when the tests had been made, a crack in a gas retort was discovered. Mr. Skinner contended that this was a question of the maintenance of plant, and quite within the control of the Company. Mr. White, cross-examined by Mr. F. W. Scorah for the Company, said the crack in the retort would interfere with the calorific value of the gas. Mr. Scorah urged that there were bound to be mishaps which no one could foresee or control; and he submitted that the crack in the retort was out of the control of the Company. On the whole, the Company had supplied gas above the required standard. The Manager (Mr. W. H. Harris) said that as soon as the crack was discovered he had it repaired. The Bench fined the Company £2, and £2 2s. special costs.

MISCELLANEOUS NEWS.

ORIENTAL GAS COMPANY, LTD.

Annual General Meeting.

The Annual General Meeting of the Oriental Gas Company, Ltd., was held at the Offices of the Company, Finsbury House, Blomfield Street, E.C. 2, on Wednesday, Nov. 25—Mr. S. HUNTER JONES (Chairman of the Company) presiding.

The SECRETARY (Mr. S. Rainer) read the notice convening the meeting, and the Auditors' certificate.

The CHAIRMAN said: Before proceeding to deal with the accounts for the past year, it is my sad duty to refer to the great loss which the Company has sustained by the death, on Oct. 14 last, of our late Chairman, Mr. Hubert Dynes Ellis. Mr. Ellis, as you will remember, was unable, through ill health, to preside at the annual meeting last year; and though he recovered sufficiently to resume his duties at the Board table, it was apparent, to the great sorrow of his colleagues, that he was in failing health. I know you will be glad to hear that the resolution of sympathy with him you were so kind as to pass at the last meeting gave him very great pleasure and softened his disappointment at not being with you then. It is difficult for me to say all I would on this sad occasion, but, as one who had the privilege of a very close friendship and business association with him for many years, I can tell you that he was wrapped-up in the affairs of this Company, which was not often out of his thoughts, I am sure. He was proud of its success, and gave of his best to its interests. He filled the position of Director for 32 years, and was Chairman for 15. I think all will agree that he filled that position with great ability and dignity. We, his colleagues, will miss him all our lives, and I think the shareholders who have attended these meetings in the past—as some of you have for a long period—will feel a blank when they come here in future. They will miss, as we all do to-day, a very distinguished figure. Well, gentlemen, we all have to pass on, but memories remain; and the memory of our late esteemed and venerable Chairman will remain ever green in the hearts of his friends and colleagues. I would ask you, as a mark of respect to his memory, to rise from your seats for a short space.

The meeting stood in silence. Afterwards,

Mr. BERTRAM ELLIS expressed—both as a son of the late Chairman and as his colleague on the Board—his most grateful thanks.

The CHAIRMAN, continuing his remarks, said: As mentioned in the report, the late Mr. Ellis had resigned his seat shortly before his death, and the Directors, knowing the state of his health, were compelled, with great reluctance, to accept his resignation. The vacancy on the Board has been filled by the appointment of Mr. William Graham Bradshaw.

DIRECTORS' REPORT AND STATEMENT OF ACCOUNTS.

With regard to the accounts we present to you, and comparing them with those of the previous year, in the balance-sheet on the debit side the first five items, capital stock, reserve fund, depreciation, renewals suspense, and exchange equalization accounts, remain unchanged. In the sixth item (the amount due by the Company, including outstanding dividends and sundries), amounts due by the Company are less by £3431, owing to tradesmen's bills having been more closely paid-up than was the case the previous year. There is a satisfactory reduction in the Bank loan of £6085, and there is an increase in the balance from profit and loss account of £2923. On the credit side of the account, the expenditure in capital account remains the same as in the previous year; all expenditure on improvements and extension of plant having been borne by revenue. The amount due to the Company is less by £2488, owing principally to the fall in the prices of residuals. Coals, &c., are less by £1258, due to smaller quantities in stock. The market values of our securities are slightly less by £305. Cash in Calcutta and London is less by £2847, owing to repayment of Bank loan.

Turning to the revenue account and the debit side of it, coals, purification, and wages cost less by £706. Salaries are up by £1242, due to renewals of agreements with officers at increased remuneration, and also to a gift the Board made to the late Assistant Engineer, who has retired from the Company's service. Indian income-tax is higher by £536, mains and services, &c., cost more by £3094, due to necessary extension of mains to meet increasing demand for gas. Wear and tear of works is less by £1203. Bad debts are slightly less by £38. General expenses are rather more by £193. On the credit side of the revenue account gas rental is higher by £3483. Residual products are less by £5434, due to lower market prices. Exchange is better by £2893; the balance of profit is less by £2172, the reserve fund remains the same, and the balance on the profit and loss account is higher by £2923.

The dividend we recommend to you is the same as in the previous year—namely, at the rate of 4½ p.ct., which, with the interim dividend of 3½ p.ct. paid in May last, makes 8 p.ct. for the year, less tax.

As regards the working results, the Company carbonized 47,963 tons, costing £50,043, as compared with 45,665 tons the previous year, costing £49,776. The gas sold totalled 492,881,900 c.ft., compared with 473,773,700 the previous year—an increase of about 4 p.ct. There has been an increase of 745 in the number of stoves, gas-heated water apparatus, and other gas-consuming appliances. The year has been, I am glad to say, uneventful. Happy is the Company, like the nation, which has no history. Our thanks are due to our capable and energetic Engineer and Manager, Mr. Snelgrove, whom we have had the pleasure of seeing this year here on leave; to his assistant, Mr. Garsed, and to all the staff and employees in India, for work well done; and also to our Secretary and his small London Staff for their vigilant and unremitting attention to the Company's business on this side.

No questions having been asked,

The CHAIRMAN moved the adoption of the report and accounts.

Mr. BERTRAM ELLIS seconded; and they were adopted.

DIVIDEND.

Mr. H. H. MACLEOD proposed that a dividend of 8 p.ct. (less income-tax) for the year be declared.

Mr. W. G. BRADSHAW seconded.

The resolution was carried.

RE-ELECTION OF DIRECTORS.

The CHAIRMAN proposed the re-election of Mr. H. H. MacLeod and Mr. W. G. Bradshaw (the retiring Directors). Referring to Mr. MacLeod, he said a better Director and a more agreeable colleague he never wished to meet. His knowledge of Indian affairs was of the greatest benefit to his colleagues on the Board. He had helped more than was realized with regard to one very important item of the Company's expenditure—namely, coal, as well as in other directions.

It would be presumptuous on his (the Chairman's) part to say much about Mr. Bradshaw. He was well known in the City, held high positions in the gas industry and in the banking world, and was Vice-Chairman of the Midland Bank; in many walks of life his name was honoured and respected, and his services on the Board would be a great asset to the Company.

Mr. B. M. GILL seconded; and the resolution was carried.

Mr. MACLEOD and Mr. BRADSHAW returned thanks for their election.

RE-ELECTION OF AUDITORS.

On the motion of Mr. G. M. GILL, seconded by Mr. ARTHUR R. BURCH, Messrs. S. W. Savage and F. J. Bradfield were re-elected Auditors at the same remuneration as in the previous year.

VOTE OF THANKS TO THE STAFF.

Mr. BERTRAM ELLIS, proposing a vote of thanks to the staff, both in Calcutta and London, said that Mr. Snelgrove (the General Manager) had attended all the Board meetings held during his stay in this country, and had been of very great service to the Board. In a tribute to other members of the staff in India, he drew attention to the fact that, though Calcutta had been troubled with heavy rains and floods, there had been no complaints about the lamps, arising from the waterlogging of mains. There had been a great extension in the use of gas appliances in Calcutta. Good work had been done by Mr. Garsed, the Assistant Manager (who had carried on in the absence of Mr. Snelgrove); by Mr. Bacon, the Mains Superintendent, and his Assistant, Mr. Bathgate; by Mr. Morrison, the Meter and Fittings Superintendent; and by Mr. Savage, the Company's Chemist. Mr. Smith, the Works Superintendent, had also given his usual efficient services. In a tribute to the staff in London, he said Mr. Snelgrove had borne testimony to Mr. Rainer's good work in meeting the indents and demands for plant from Calcutta. The warmest thanks were due to the staff abroad and in London.

Mr. MACLEOD seconded, and the vote was passed with acclamation.

Mr. RAINER acknowledged the vote of thanks, and said he would convey it to Mr. Snelgrove and his colleagues. With regard to himself and his assistants in London, it was always their endeavour to give the Company the best service possible; and he was glad that the Directors and shareholders had expressed appreciation.

VOTE OF THANKS TO THE BOARD.

Mr. F. J. BRADFIELD expressed to the Chairman and his colleagues on the Board the shareholders' appreciation of their efforts during the past year. The fact that there were so few shareholders present bore testimony to the excellence of the Board's administration, because it was a well-known fact that satisfied shareholders did not attend general meetings, at any rate in the case of gas companies. He congratulated Mr. Jones on his first complete year as Chairman of the Company, and the other Directors upon the excellent results reflected by the accounts. The only item which might be referred to was the slight reduction of profit; but this was more apparent than real, because the explanation why the figure was not so high as last year was that a certain amount of expenditure for capital purposes was met from revenue.

The vote of thanks was accorded with enthusiasm.

The CHAIRMAN, on behalf of the Board, expressed their gratitude for the vote of thanks. Though he had said, in his opening remarks, that the year just concluded was uneventful, he was afraid it had been a sad one, because Mr. Ellis' illness had been a constant source of regret to his colleagues. He himself could not claim any special credit upon the completion of his first year as Chairman, because the Board had merely carried-on on the lines laid down by the late Chairman. If the results had given the shareholders satisfaction, the Directors were satisfied.

The meeting then closed.

Keighley Gas Undertaking.—The Keighley Town Council, on Nov. 24, decided that, out of a net profit of £4810 on the gas undertaking during the past year, the sum of £4295 (the estimated cost of public lighting) be transferred to the relief of district rates; that a donation of £250 be made to the Keighley Victoria Hospital; and that the balance be transferred to reserve or renewals account. Increases were shown in the use of cookers, and in sales and meter rents. Referring to the poor market for tar, Mr. R. Calverley, Chairman of the Gas Committee, said that if public authorities would use more tar and less bitumen for road-making it would mean better returns for gas undertakings.

GAS MANTLE INQUIRY REPORT.

A Duty Recommended.

The Committee appointed by the Board of Trade to inquire into and report upon an application made by the Incandescent Mantle Manufacturers' Association, in accordance with the terms of the memorandum relating to procedure and inquiries in connection with the Safeguarding of Industries, presented their report last July, and it has now been published. The members of the Committee were: Sir Frederick Mills, Bart., J.P., Mr. J. Arthur Aiton, and Sir John Barran, Bart.

In the first part of the report, it is mentioned that the applicants' case was conducted by Mr. J. P. H. Soper, Managing Director of Monarch Mantles, Ltd.; and Mr. N. L. Macaskie appeared in opposition on behalf of a group of gas mantle importers and wholesalers of the London Chamber of Commerce, and others. The applicants' complaint was directed against competition from four Continental countries—Germany, Poland, Austria, and Italy. It soon became clear to the Committee, however, that the case really turned upon the question of German competition, since imports from Germany represent the bulk from all sources. The Committee, therefore, concentrated attention in the main upon German competition.

IMPORTANCE OF THE INDUSTRY.

The first question to which the Committee were required by the terms of the White Paper to address themselves was whether the applicant industry is, by reason of the volume of employment engaged in the production of mantles, or by reason of the nature of the goods produced, an industry of substantial importance. The applicants themselves made no claim that it should be regarded as important in volume. Even in the year 1920, when foreign competition was very small, the number of workers employed barely reached 3300, and during the last three years the average has been 1624. The claim of the applicants to substantial importance was based upon the nature of the goods produced. In the first place, the article is of very widespread and popular use, and it has enabled the gas industry in recent years to make concentration upon calorific power for lighting as well as for heating. It was also pointed out that, but for the mantle, town gas could not have been stripped during the war. While the gas mantle may not possess in another emergency the significance from this point of view which it had during the late war, the Committee nevertheless think it is important that mantles should continue to be manufactured to a substantial extent in this country. Furthermore, if gas mantles were no longer made here, the thorium nitrate industry (which was for the first time firmly established during the war) would again be lost. With it would go also British supplies of cerium and meso-thorium, and compounds of the rare earth metals which are obtained as bye-products in thorium manufacture. Cerium compounds were during the late war of great importance to the fighting services, in that flame-arc carbons, required for searchlights, demanded large quantities of cerium fluoride; and other uses of importance are to be found in connection with the manufacture of special glasses, luminous compounds for aeroplane equipment, compasses, and gun mountings.

The Committee, therefore, find that the gas mantle industry is to be regarded as of substantial importance by reason of the nature of the article produced.

FOREIGN COMPETITION.

In considering the second question, as to whether foreign mantles are being imported into, and retained for consumption in, the United Kingdom in abnormal quantities, the Committee give the following tabular statement:

—	Total Sales for British Consumption.	British Production, *less* Exports.		Retained Imports.	
	Gross.	Gross.	P.Ct. of Total.	Gross.	P.Ct. of Total.
1920	470,287	391,994	83·4	78,293	16 6
1921	365,781	254,918	69 7	110,863	30·3
1922	451,454	241,265	53·4	210,189	46·6
1923	464,175	256,234	55 2	207,941	44 8
1924	432,096	267,424	61·9	164,672	38·1

It is mentioned that in the first six months of this year 113,211 gross have come in, against 62,866 gross for the corresponding period of 1924. In interpreting these figures, it is necessary to bear in mind that for some 21½ months between the end of October, 1922, and the middle of August, 1924, imports of gas mantles from Germany were subject to a duty of 33⅓ p.ct. imposed under Part 2 of the Safeguarding of Industries Act, 1921. How largely Germany contributed to the total imports is shown by the following figures: 1920, 21,359 gross; 1921, 63,756 gross; 1922, 155,957 gross; 1923, 127,733 gross; 1924, 105,672 gross. It is mentioned that the falling-off in imports from Germany in 1923 would probably have been heavier, but for the very rapid depreciation of the German mark, which was then taking place. Imports from other countries also increased in 1923 (fostered in part by currency depreciation), and the British manufacturers experienced little benefit from the duty in that year. It was not until the earlier months of 1924, prior to the withdrawal of the duty, that they derived an appreciable benefit from it.

The applicants complain that during the last quarter of 1924, after the duty had been removed, the proportion of foreign imports to total sales increased substantially to some 43 p.ct. of the trade. This was probably due in some measure to postponement of importation pending the removal of the tariff. On the other hand, the increase of imports during the present year is due in part, the Committee think, to anticipation of a possible tariff as a result of the present application. In concluding this section of their report, the Committee observe that the average importations during the year 1921-24 were at a rate which did in fact cause the machinery of the British factories to be largely unemployed,

COST OF BRITISH AND FOREIGN MANTLES.

The next question considered by the Committee was whether the foreign goods so imported are being sold or offered for sale in the United Kingdom at prices which are below those at which similar goods can be profitably manufactured or produced in the United Kingdom. The Committee obtained cost accounts of each of the four principal British mantle factories, and similar figures were given in confidence to them by the opponents relating to the largest German works, which claim to supply more than half the gas mantles imported into this country. Evidence was tendered that the German prime cost of mantles is considerably lower than the British. The same applies to factory on-costs and overhead charges for administration and selling. High overhead charges are no doubt largely a result of the reduced volume of trade handled by the English manufacturer as a result of foreign competition, and also of the heavy expenses necessary to keep the trade in advertised brands.

> "With regard to prime cost, Germany possesses an advantage in cheaper labour. The applicants urged that German mantle producers benefit also through the cheaper labour in the other industries which produce materials for them; and we find that the German mantle makers are paying substantially less than the English manufacturers for thorium and clay rings. In regard to thorium, however, the position is equalized so far as German mantles sent to this country are concerned by the flat rate import duty of 9d. per gross of mantles representing Key Industry Duty upon the thorium content. In regard to other materials there appears to be little difference of price between this country and Germany; and the difference is not always in favour of the German mantle maker."

The Committee were informed that the British mantle manufacturers maintained a price association which practically eliminates price competition between them, and that the cheaper British mantles are sold at a price which shows a definite loss. Speaking generally, the Committee find that there is a substantial margin between the prices at which foreign mantles are sold to the wholesaler in this country and the figure at which similar goods can be profitably manufactured here and sold to the wholesaler.

EFFECTS OF FOREIGN COMPETITION ON EMPLOYMENT.

The next question considered was whether, by reason of the severity and extent of such competition, employment in the manufacture or production of such goods in the United Kingdom is being, or is likely to be, seriously affected. The applicants furnished figures relating to outputs, sales, and employment since the beginning of 1920. From the tabulated statement, we give the following total and average figures:

Year.	Quantity Made. Gross.	Quantity Sold. Gross.	Average No. of Workers per Week.	Average No. of Hours Worked per Week.	Total Hours Worked (Thousands.)
1920 . . .	451,333	443,731	3238	47·7	8037
1921 . . .	260,189	275 931	2511	35·1	4581
1922 . . .	234,771	261,196	1582	42·1	3502
1923 . . .	258,668	276,435	1582	43·6	3623
1924 . . .	277,648	290,529	1707	43·8	3908

These figures cover the firms within the Gas Mantle Manufacturers' Association which claim to cover 95 p.ct. of the output of the industry. It can be seen from the data that the numbers employed have not varied greatly in the last three years, and the hours worked have risen somewhat; but in both respects the industry has been employed much below the full capacity of its buildings and plant.

FAIRNESS AND UNFAIRNESS OF THE FOREIGN COMPETITION.

The next section of the review deals with the question whether such exceptional competition comes largely from countries where the conditions are so different from those in this country as to render the competition unfair. Without entering into a review of the observations of the Committee on this point, we simply give their conclusion that, on a review of the conflicting evidence, they are inclined to accept the facts laid before them on both sides with a considerable measure of reserve. That is sufficient justification for not dealing with this section of the report.

EFFICIENCY OF THE INDUSTRY.

The next matter dealt with is as to whether the applicant industry is being carried on in the United Kingdom with reasonable efficiency and economy. From the point of view of factory organization and equipment, the Committee have reason to believe that there is no great difference between English and foreign factories. They are certainly of opinion that the English factories are efficiently equipped and worked. In regard, however, to factory on-costs, and to general overhead and administration expenses, there is room for considerable improvement. No doubt high on-costs are partly a consequence of unused productive capacity at the works; while selling and administrative expenses are inevitably increased when a large part of the staple trade in non-advertised proprietary brands and in so-called "own name" brands (*i.e.*, mantles sold to dealers who sell them in boxes with their own name marked on) is lost. The Committee were struck, however, by the fact that the German works, whose costs were shown to them, had comparatively much lower overhead charges, notwithstanding that the output was said to be substantially less than before the war. A natural way

of reducing overhead charges would, the Committee point out, be by means of greater concentration in the industry.

DESIRABILITY OF IMPOSING A DUTY.

In considering this matter, the Committee state that the British gas mantle industry is certainly not able in its present state to meet its chief foreign competitor on equal terms. They do not think that it is likely to go under, but it way well dwindle into the production of special brands only. The German mantle undersells the corresponding British mantle—not heavily, but quite definitely—and the home industry is in consequence working much below its full capacity. The Committee accept the broad fact that the continued production in this country of thorium and cerium is imperative; and they are satisfied that if mantles were not made here the economic production of those compounds would go also, as there is apparently no prospect that they would find a sale abroad.

THE DUTY PROPOSED.

The Committee are clear that it is a choice between giving reasonable help to the industry and maintaining the thorium and cerium industries in some other way of which they have no indication. Should the former course be chosen by the Government, they suggest that a flat rate not exceeding 6s. per gross (equivalent to ½d. per mantle) would, in their opinion, enable the mantle industry, re-organized and concentrated as it might be, to maintain itself in a healthy state.

GAS REGULATION ACT APPLICATIONS.

There has appeared in the "London Gazette" the following notice regarding applications to the Board of Trade under the Act.

Southend-on-Sea and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 5s. 3d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 13·6d. per therm.

DANISH GAS COMPANY.

The Directors, in their report for the year ended June 30 last, state that the balance standing to the credit of the profit and loss account, after charging debenture interest and pensions, is Kr. 819,366.27. Out of this sum they recommend that dividends of 5 p.ct. on the preference shares and 6 p.ct. on the ordinary shares be declared. This will leave about Kr. 327,125 (according to the rate of exchange) to carry forward.

The gas-works still owned by the Company show a loss on the working during the past year, due to the adverse rate of exchange and the low value of residuals. The water-works and other properties were remunerative; but the principal credits to the profit and loss account are due to the successful outcome of the claim, for compensation for the loss of the Flensburg Gas-Works in 1917, made by the Committee of British Shareholders under the Treaty of Versailles. A compromise has been effected whereby the German Government agree to the payment of £106,000, on condition that the Company renounce in their favour 70·57 p.ct. of the debt due by the Flensburg Commune.

The Directors have agreed to sign such a renunciation, and as a result the accounts have been credited with a sum of £100,000, after deducting the estimated amount of the expenses of the action. This sum represents both capital and interest, which latter appears on the profit and loss account. The remaining proportion of the claim—viz., 29·43 p.ct.—is still outstanding; and the Directors are continuing the action, to obtain this through the Danish Government, which was postponed pending the result of the claim under the Treaty of Versailles.

There has been a further capital expenditure of Kr. 590,471.58 for additional plant, mains, &c., during the past year, mainly due to the increasing demand for gas at Odense. All extension work and repairs have now been completed, and the works are prepared to meet the demands of the coming winter. The quantity of gas sold during the past year has been 312,152,000 c.ft., against 316,807,000 c.ft. in the previous year, being a decrease of 1·5 p.ct. Gas supplied in the town of Viborg is, however, included in the latter quantity; and the increase at the towns of Odense and Ribnitz, which the Company still supply, was 6·7 p.ct.

The rapid improvement since June last in the value of the Danish kroner as compared with British sterling has greatly facilitated the transfer of money from Copenhagen to London; and the Company's 4 p.ct. debenture stock will be paid off at par on Jan. 1. It is hoped that in the near future a further redemption of capital may be possible. Further delay has been experienced in obtaining a settlement of the over-valuation of the Frederiksberg Gas-Works; but the Directors are making every effort to bring the matter to a conclusion.

"Winter Ease" Week.—The Directors of the Davis Gas Stove Company invited over 5000 gas consumers to attend their Oxford Street showrooms last week (Nov. 23 to 28). The occasion of this special invitation was "Winter Ease" week—an appropriate term as applied to the display of such labour-saving devices as "Injector-Ventilator" gas fires, automatic gas-cookers, and up-to-date coke appliances. A large number of visitors availed themselves of the invitation. Keen interest was evinced by the women visitors in the "Coquette" coke grate, from which the ash falls into a concealed ashpan under the fire. Tea was served to the numerous visitors each afternoon.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

Application to Revise Standard Price.

On Nov. 16, Mr. J. F. Ronca (Director of Gas Administration) opened an inquiry into an application, under section 1 of the Gas Regulation Act, for a revision of the standard price of the Aldershot Gas, Water, and District Lighting Company in connection with gas supply. The application was made by the Aldershot Corporation and the Farnborough, Fleet, and Frimley Urban District Councils. The present standard price is 17·4d. per therm; and the figure to which the applicants suggest it should be reduced is 13·2d. The Company, however, held that the new standard price should be higher than the latter figure.

The applicants were represented by Mr. F. N. Keen, with Mr. Arthur Valon (of Messrs. W. A. Valon & Son, Consulting Engineers, Westminster) as Technical Adviser. The Company were represented by Mr. H. P. MacMillan, K.C., and Mr. Jaques Abady; the Technical Adviser in this case being Mr. George Evetts (Consulting Engineer, Westminster).

Mr. KEEN, after stating that the present standard price of the Company was fixed by the Board of Trade in 1921, dealt briefly with the history of the Company, from the time of its incorporation as a statutory concern in 1866, until the present time. In an Act in 1909 the standard price was fixed at 3s. 8d. per 1000 c.ft., and the slide on the "A" and "B" stock was fixed at 9d. p.ct. per half-year for each 1d. by which the price of gas rose or fell above or below the standard price. This was equivalent to 1s. 6d. p.ct. per annum. A special purposes fund was also authorized; the contributions each half-year not to exceed ½ p.ct. of the paid-up capital, the total amount in the fund not to exceed 10 p.ct. of the paid-up capital of the Company. The present standard price of 17·4d. per therm was fixed by a Board of Trade Order in 1921, and the slide on the standard dividend stock was translated from the volumetric to the thermal basis—*i.e.*, the slide was to be 9d. p.ct. per half-year in respect of every 0·2d. rise or fall in the price of gas above or below the standard price. Dealing with the position of the Company, he said that only a small proportion of the capital was subject to the sliding-scale, that capital being £50,000 of "A" stock and £10,000 of "B" stock, though in 1918 power was given to raise further capital by the issue of "B" stock, if desired. The remainder of the capital carried a maximum dividend. The sliding-scale provision attaching to part of the stock was the only security the consumers had in regard to the reduction of the price of gas. The Company were not regulated by a maximum price at all, but only by a standard price, and in relation only to part of the capital. Counsel said it was also material to notice that the Company supplied water and electricity as well as gas, and there was nothing to keep the profit derived from any one of their undertakings in a watertight compartment. It was true that separate accounts must be kept of capital and revenue in respect of these services, but the amount earned by the water and electricity undertakings could be applied for the purposes of paying dividend on capital used for the purposes of the gas undertaking, and *vice versa*.

Mr. *Arthur Valon,* in evidence, said that, in addition to having examined the published accounts of the Company, together with the schedule lodged by them with the Board of Trade in 1921, when they had made their original application for the fixing of the standard price on the thermal basis, he had had the advantage of information furnished to him by the Company, which had brought the published accounts up-to-date. In arriving at what the new standard price should be, he had taken the published accounts for 1924 as a basis, this being the last complete year for which accounts were available. He had made an estimate of the cost of supplying gas, based on the 1924 results, and had adjusted the figures wherever it appeared to be necessary, owing to the changes of prices or conditions which had taken place since the end of the year.

Mr. Valon handed in a number of tables giving details of the estimated cost of supply of gas. His table showing how he arrived at what he considered the new standard price should be is reproduced.

Estimate of Standard Price.

	Pence per Therm.	
Standard price—		
Fixed by Board of Trade	17·40	
Pre-war standard price, 3s. 8d. per 1000 c.ft. at 500 B.Th.U.	8·80	
Increase in cost of supply under Gas Regulation Act as found by Board of Trade in 1921		8·60
Estimate of present cost of supply—		
41·73d. per 1000 c.ft. at 510 B.Th.U.	8·18	
Pre-war cost of supply, as per Table A.V. 8—		
21·20d. per 1000 c.ft. at 525 B.Th.U.	4·04	
Present increase in cost over pre-war		4·14
Fall in cost of supply		4·46
Allow for saving in carbonizing wages, within the control of the Company—		
0·86d. per 1000 c.ft. at 510 B.Th.U.		0·17
Net fall in cost of supply		4·29
Existing standard price.		17·40
New standard price		13·11 (say, 13·2d.)

Dealing with dividends, Mr. Valon said that the Company had paid the full statutory dividends on the stock which was subject to the sliding-scale, though part of the fall in the price of gas, which enabled the higher dividends to be paid, was due to fall in costs, which was outside the control of the Company.

Mr. Keen asked from what time there had been a reduction in cost sufficient to justify a reduction in standard price.

Witness thought it dated from about twelve months after the fixing of the standard price by the Board of Trade in 1921; but it would not have been reasonable to apply for a reduction of the standard price then. It was clear, however, that from the end of 1923 the reduction in costs had been sufficient to justify a reduction of the standard price.

Dealing with the prices charged for gas by the Company, he said that in the first half of 1924 the price was 11d. per therm, and in the second half 13d. per therm. In the March quarter of 1925 it was 11·6d., and from September, 1925, it was raised to 12·6d. He believed the 13d. charged in the second half of 1924 was a special price, and that the rise was due to some litigation with which the Company were concerned. As to the quantity of gas sold, he said it was 377 million c.ft. in 1923, which compared with a figure for 1918 of 493 millions, so that there had been a considerable drop. In 1924 the sales were 423 millions, a decided recovery. The drop, as compared with 1918, however, was not so big as it would appear to be, because the thermal value of the gas supplied in 1918 was 450 B.Th.U. per c.ft., while in 1924 it was 510. On the basis of the number of therms supplied, the reduction between 1918 and 1924 was about 3½ p.ct. His figure of 13·2d. per therm, which he had given as the new standard price, was subject to modification as the result of any claims the Company might substantiate in respect of savings effected by factors within their control. His estimate did not include savings, except that in respect of carbonizing wages.

Mr. MacMillan, cross-examining, pointed out that the amount of the capital of the Company which was subject to the sliding-scale was unusually small; but they had power to issue further "B" stock.

Witness said the actual amount involved in the sliding-scale dividend was negligible. What was important, however, was not the amount of money, but the operation of the sliding-scale as a safeguard to the consumer.

Counsel asked whether the consumer was not less affected by the fixing of the standard price in the case of the Aldershot Company than in an instance where the whole of the capital was subject to the sliding-scale.

Witness disagreed.

Counsel said the Company were in the position that, if they did not pay the maximum dividend permissible on the sliding-scale stock, they would not be able to pay the maximum dividend on the maximum dividend stock. He pointed to a clause in the Company's 1896 Act which, he said, was to that effect.

Witness said that the clause referred to was the usual one—providing that, if there was not sufficient money with which to pay the full dividend on one class of stock, there had to be a reduction in each class. It did not provide that, if the full dividend were not paid on the sliding-scale stock, there must be a reduction in the dividend on the other stock.

Counsel suggested that the fact that there was only a small amount of sliding-scale capital was a factor to be taken into account in calculating the standard price.

Witness did not think it ought to be taken into consideration.

Counsel said that another circumstance special to the Aldershot Company was that, in addition to gas, they supplied water and electricity; and he suggested that, if the position were strong in electricity or water, it would assist the Company when it went into the market for money for gas purposes.

Witness replied that the Company did not go into the market for gas capital generally, but for capital for the whole of their undertakings.

Counsel said that another circumstance was that the Company had a very wide district, and had to incur a larger expenditure in order to supply in the outer part of their zone than in the inner zone. There were differential prices, but the differentials had been decreasing, and he suggested that this also should be taken into account in fixing the standard price.

Witness replied that all differentials had a tendency to decrease, and he did not think that the decrease was a matter which could be taken into account in the present inquiry.

Counsel remarked that the outside districts had benefited by a decrease in the differential, and the Aldershot district had benefited by a reduction in the over-all cost, but the Company had had no benefit.

Later, Mr. Valon said that, if the Company were going to make a claim which he could only check by seeing the district and the works, they were wrong in not allowing him to see the works.

As to the total savings to be claimed by the Company, Mr. MacMillan said he hoped to establish that they amounted to 0·67d. per therm, in addition to the 0·17d. per therm which Mr. Valon had allowed in respect of savings in carbonizing wages, making a total of 0·84d. per therm. Mr. Valon's comment was that this was a large saving, having regard to what one knew could be done. Counsel said that if he established the 0·67d. per therm as additional savings, Mr. Valon's estimated standard price would be increased to 13·87d. The new standard price which he hoped to establish, however, was 1·33d. per therm higher than the latter figure—namely, 15·2d.

Counsel then referred to the Company's contribution to the special purposes fund, and asked Mr. Valon if he objected to its inclusion in the costs for the purpose of calculating the new standard price.

Witness replied that he did. The fund was one which Parliament had permitted the Company to accumulate for their use, if required. It partly covered the old insurance funds, and it also covered risks of strikes, casualties, &c. Its purpose was to safeguard the dividend.

Counsel said that another matter which Mr. Valon had not taken into consideration was the interest on loans; and he asked if he would agree that, if and so far as there had been an increase in the rate of interest on loans, that was an element which should be considered in arriving at the new standard price.

Witness said his view was that, so far as borrowed money had been required for providing increased working capital on the pre-war output, the Company were entitled to claim it; so far as interest on borrowed money was concerned, where this was being used for ordinary capital purposes, such as extensions, they were not entitled to claim.

Counsel remarked that the pre-war dividend on the 5 p.ct. "A" stock was £6 4s. per annum, which meant that the price of gas had dropped 16 points below the standard price—*i.e.*, 16 points of 1d. per 1000 c.ft. Therefore, if the pre-war dividend was to be maintained, the present price charged would have to represent a drop of 16 points below the standard price. Assuming that the present price of gas—namely, 12·6d. per therm—was justified, the standard price should be 16 points above that—namely, 15·8d. per therm. He asked what the dividend would be if the standard price were 13·2d. per therm, as suggested by Mr. Valon, and the present selling price of 12·6d. per therm were justified.

Witness said the dividend would be £5 4s. 6d.

With regard to the calculations made in order to arrive at the present costs of supply, Mr. MacMillan said that the figure put forward by the Company on the gross cost of coal per ton was larger than that given by Mr. Valon, and the figure given as revenue from residuals was less than Mr. Valon's.

Counsel said that the Company's figure for the gross price of coal last year was 30s. 4·5d., as against Mr. Valon's figure of 30s. 1d.

With regard to coke, witness said that he had taken the price of 21s. 11d. per ton, which was the average net revenue from coke up to the end of September, 1925.

Counsel said that the price of 21s. 11d. was the average received by the Company for the first nine months of 1925; but the net revenue from coke for the three months ended Sept. 30 was 19s. 11d. per ton.

With regard to sulphate of ammonia, Mr. Valon had taken the profit as £4 8s. 3d. per ton. It was pointed out by Mr. MacMillan that since July 1, 1925, the Company had sold 200 tons at an average price of £10 7s., which, after deducting £7 18s. for manufacturing costs, left a profit of £2 9s. per ton. Witness said that in most companies recently the profit had been £4 or over per ton. For repairs and maintenance of works and plant, and for purification, Mr. MacMillan said that the Company's figure was 9·38d. per therm, against Mr. Valon's figure of 8·38d. As to the number of men employed, Counsel said it had been increased between 1914 and the present time, as the result of the introduction of the 8-hour shift; and witness agreed that this would represent a legitimate increase in the cost of gas for the purpose of arriving at the standard price.

Mr. *Valon*, in re-examination, referring to the new standard price suggested by the Company—namely, 15·2d. per therm—said that this represented a reduction of only 2·2d. from the standard price fixed in 1921. From his experience with regard to other companies, this reduction was very small.

The inquiry was adjourned until Nov. 21.

Saturday, Nov. 21.

When the inquiry was resumed on Nov. 21, Mr. George Evetts gave evidence on behalf of the Gas Company, and said they did not desire to avoid any reduction in the standard price as the result of reduction in costs outside their control since the standard price was fixed in 1921.

Mr. *Evetts* handed in a number of tables giving details of his calculations in arriving at the new standard price. The present total cost of gas was 10·27d. per therm, and the cost of gas in 1914 (adjusted in order to make it comparable with to-day's costs) was 4·25d. per therm, making the increase in the cost of supply since 1914 6·02d. The original standard price, which applied in 1914, was 3s. 8d. per 1000 c.ft., equivalent, for a 500 B.Th.U. gas, to 8·80d. per therm; and this, added to the 6·02d. increase in the cost of supply since 1914, made a total of 14·82d. To this figure he had then added savings in respect of the use of coal, coke, and breeze handling plant, and in respect of gas used on works, and the "Columbus" plant, and increased stove and meter rents; these savings amounting to 0·38d. per therm. This, added to the 14·82d., made a total of 15·2d., which, he claimed, should be the new standard price, as compared with the present standard of 17·4d. per therm. The standard price which would enable the pre-war dividends to be paid on the sliding-scale stock would be 15·8d. per therm.

With regard to the effect of the rigid interpretation of the proviso to section 1 of the Gas Regulation Act (under which this inquiry was held) and the method of calculation which had been adopted as the result of that interpretation, he said there was no proper recompense to the Company for the additional capital that had to be expended since 1914, and there was no compensation in respect of the growth of the undertaking arising from the Company's enterprise.

Witness then gave details as to the sales of gas and capital expenditure per million. These showed that between 1914 and 1918, owing to war conditions, the consumption had increased from 363 to 493 millions, while capital expenditure per million sold had decreased from £771 to £679. From 1918 to 1923 there was a progressive decrease in consumption (the figure in the latter year being 377 millions) and a progressive increase in capital per million, which was then £1099. In 1924, however, consumption had increased to 423 millions, and the capital per million had decreased to £1092. About £127,000 had been spent since 1918 in order to secure increased consumption—which was principally in the outside districts—to replace the loss sustained at the time of the Armistice. The 1924 figures showed that the Company were just beginning to reap the advantage of this.

A table was shown to illustrate the effect of reducing the differential

charges in the outside areas; and it was stated that this had resulted in a loss to the Company from 1914 to the present time of 0·32d. per therm. There had been an increased consumption in the outside districts since 1914, accompanied by a decrease in the inner district, and this had involved high capital expenditure. Under the system of calculation so far adopted in order to get a comparison between pre-war and present-day costs in arriving at the revised standard price, he said the outside districts reaped the advantage due to the diminution of the differential, and the inside district reaped the advantage due to the increased over-all consumption and consequent decrease in price. The Company, however, had lost both ways. Referring to the new standard price suggested by Mr. Valon, he said if this were adopted there would be an increase of only three points above the standard dividend of 5 p.ct., making the dividend £5 4s. 6d., whereas in pre-war days the standard dividend was increased by 16 points to £6 4s. As to coal costs, his present price per ton was given as 30s. 1·6d., which compared with 30s. 4½d. per ton in 1924. The 30s. 1·6d. was arrived at by adding handling costs of 6·6d. per ton to the present contract price of 29s. 7d. The present contract price was a remarkably good one from the Company's point of view. They had not been able to extend the contract at that price beyond May 1, 1926, and consequently he could not say at what price they were likely to buy coal for the next twelve months. He did not think it fair to reduce the cost of coal on the hypotheses that the Company would continue to use Durham coal only, that they would get better working results than formerly thereby, and that they would be able to purchase Durham coal in the future at the same price as at present.

With regard to coke, he said he had estimated upon a figure of 18s. 9d. per ton net, though the price received at present was lower than this. He did not agree with Mr. Valon that the Company should get better prices. As to the suggestion that sulphate of ammonia prices were low, he said the Sulphate of Ammonia Federation prices which had been given referred to neutral sulphate, whereas the prices received by the Aldershot Company were for ordinary quality sulphate, and the two were not comparable. Witness's figures for repair and maintenance charges were higher than those of Mr. Valon, but they were, at the same time, lower than the actual charges at present.

Mr. F. N. KEEN, cross-examined with regard to the Company's complaint that the usual method of calculating increased costs as between 1914 and the present time, for the purpose of arriving at the standard price, did not give them credit for having increased their business. If Mr. Evetts had objected to the principle that had been adopted all along, why had he not raised the objection before?

Witness said he had protested on more than one occasion to the Board of Trade, and to Mr. Valon, that the present method of calculation was wrong, that it inflicted injustice, and did not interpret correctly the words of the proviso to section 1 of the Gas Regulation Act. He had, however, endeavoured to get as much as he could out of the present stereotyped method of calculation.

Asked why the Company should receive credit for increased business, he said that enterprise was not forced upon a company, and, therefore, was a circumstance within their control. They need not necessarily lay mains, and take a sporting chance of a district being developed. If a house were more than 25 yards from a main, they could refuse to supply gas to that house; and a company which adopted such an attitude came out best every time in these applications for revision of standard price.

Replying to further questions, he admitted that the Company were now supplying gas through some of the mains which supplied Government Departments during the war; but some of those mains were not used at all to-day.

COUNSEL, referring to differential prices, said that the Company were not at present charging the full permissible differential in some parts of the area.

Witness remarked that this was in pursuance of the Company's policy of charging in each district what they considered to be a justifiable charge rather than the highest charge they could make.

COUNSEL said that the Company had adopted a policy which it had suited them to adopt.

With regard to coal prices, witness said that if the present contract had been extended beyond April 30 he would have had to reckon 31s. 6d. per ton, instead of 29s. 7d.

COUNSEL said that in September Mr. Evetts had calculated the economic selling price of gas by the Company at 12·8d. per therm, and in that figure he had not taken account of the increased efficiency which would arise from the employment of Durham coal only, though he knew the price he would be paying for that coal for the next seven months.

Witness said he had calculated on a yearly basis, with the knowledge that if he had extended the contract he would have had to pay 31s. 6d. per ton for Durham coal.

COUNSEL exhibited a chart showing the trend of prices of Peel Main quality, Durham coal, from the beginning of 1924 to the present time. This showed that in March, 1924, the f.o.b. price was about 25s. 9d. per ton, and in September, 1925, it was about 16s. 7d., and continued at that level into November. He asked, therefore, why Mr. Evetts, in his estimates, had adhered to the 1924 figure.

Witness replied that he knew of no gas company which had been able to buy at prices which had dropped from 25s. 9d. to 16s. 7d. in the period mentioned.

Questions were put by Mr. Keen to show that in the last few months the percentage of the total coke sold at yard prices (which were higher than factors' prices) was greater than previously. Mr. Evetts said that yard sales never reached more than about 12½ p.ct. In reply to further questions, he remarked that, if the price of coke was increased 1s. per ton, the Company would lose 50 p.ct. of the business. In all his investigations he had never found a group of officials who studied the coke market more than those at Aldershot.

As to sulphate of ammonia prices, Mr. Keen suggested that the Company should get a better profit than £2 9s. per ton. Mr. Evetts admitted that the figure was low, but pointed out, later, that he had made an error in calculating his manufacturing costs, and that the profit should be £2 17s. per ton. The prices he obtained were better than the Federation prices.

COUNSEL, referring to net coal costs at the present time, said that Mr. Evetts' figure of 18·23d. per 1000 c.ft. was 7·47d. above that for 1924, and suggested that this was ridiculous.

Witness said that, unfortunately for the Company, the position was as stated; but it was not ridiculous.

Mr. MACMILLAN, summing up on behalf of the Company, said the suggestion had been made by Mr. Valon that the rigidity of the scheme which was set out in section 1 of the Gas Regulation Act in connection with the revision of the standard price was such that, however distasteful the task was to him, he was bound to work under those provisions, and so to operate what was really an economic injustice. His (Mr. MacMillan's) suggestion, however, was that Parliament had not prescribed the Board of Trade's task with anything like the rigidity which Mr. Valon appeared to apprehend. The outlook of the Act was obvious. It was not only to provide for an alteration of the system of charging for gas from the volumetric to the thermal basis, but was intended also to remedy a state of affairs brought about through the great increase in the cost of labour and material consequent upon the war, so that companies would not be prejudiced by circumstances beyond their control. Accordingly, when the standard price was fixed in the case of this Company under the provisions of the Act, the Board of Trade had to consider whether increased costs were due to circumstances beyond their control; and the datum point was June 30, 1914. The proviso dealing with revision gave the Board of Trade power to revise the standard price at any time, if satisfied that the costs and charges "of and incidental to the production and supply of gas" had substantially altered due to circumstances beyond the Company's control. *Primâ facie*, he would have thought that the datum point for the purpose of this comparison, therefore, should be March 30, 1921, when the standard price was fixed, because a substantial alteration since that time had to be established. He recognized that the practice under the terms of the proviso had been to reconstitute the 1914 position, and to contrast the present-day position with that. He did not invite the Board of Trade in this case to change this procedure, but would like to make a reservation on behalf of the gas industry upon that interpretation. It was manifest, whichever be the true reading, that the onus was upon the applicant to show not only a substantial alteration in costs, but that the circumstances to which that substantial alteration was attributed were beyond the control of the Company, or could not reasonably have been avoided by them. Furthermore, the powers conferred upon the Board of Trade were exceedingly wide, and perhaps there had been insufficient attention to the fact that consideration must be given to alteration of "the costs and charges of and incidental to the production and supply of gas." A great deal more than "costs of production of gas" was contemplated; and the words gave the Board of Trade the widest possible discretion in considering the position of a company, and giving weight to all considerations affecting its financial position—the intention of Parliament being, as far as possible, to indemnify companies against losses not due to their own fault, and, at the same time, to protect consumers by revision in the converse manner. Even if the Board were satisfied that there had been a substantial alteration, their discretion was still further emphasized in the Statute; they were not bound to act merely ministerially, because the Board were given power to make an Amending Order "if they thought fit." The position had been left by Parliament in as spacious a manner as one could well conceive, to enable the Board to take into consideration all the circumstances affecting a company, but which were outside its control. Therefore, he deprecated entirely the suggestion that there had been laid down so rigid a scheme as Mr. Valon felt constrained to impose. He (Mr. MacMillan) was offering to the Board and to Mr. Valon the opportunity of doing justice rather than iniquity.

Continuing, Counsel said that Mr. Valon had indicated that the decrease in the differential charges, contrasted with the increase in cost of supply in the outside areas, was an economic circumstance which, unhampered by the terms of section 1, he would have taken into account. He (Mr. MacMillan), however, urged that it was a consideration eminently appropriate to be taken into account at this inquiry. When an applicant for revision assumed the onus of proving that a decrease in costs reflected by the statistics of the Company was outside the control of the Company, he had to assume the burden of quantifying that decrease, and, if he failed, the Board of Trade, on the general rules of evidence, were bound to assume in favour of the Company.

Another circumstance in regard to this Company was their special experience during the war. They had had to cope with a large and suddenly increased demand, and had had to make considerable expenditure to meet that demand. They had found themselves with mains which were of no use, and with a lot of capital which was unremunerative; and their output had declined. The Company had, therefore, to address themselves to the task of restoring the position they had occupied at the end of the war; and the statistics showed how admirably they had done so. The position was being recovered, but at heavy cost. This was one of the most striking features of this Company; and it would be a great hardship if they were to be penalized in any way for having met so efficiently the demands upon them in the national interests, and were to have no recognition for the recovery they were making. The decrease in costs of production due to enterprise or greater efficiency of administration or manufacture was just one of those things within the control of the Company for which they should be given the benefit.

With regard to the contention that the contribution to the special purposes fund was a matter to be taken into account in arriving at costs, he said the amount was not of very great moment, but the question of principle was of some interest. He submitted that it was a proper charge "incidental to the production and supply of gas." The fund was dedicated to meet emergency expense, and

Mr. Valon's description of it as a fund to equalize dividends was a partial description of it. It was intended also to secure the equalization of prices to the consumer. It was expressly provided that the objects upon which the special purposes fund of the Gas Company was to be expended were things beyond the control of the Company. He maintained that it was a proper charge against revenue, and a proper charge " of and incidental to the production and supply of gas." If the Company were provident, and put aside an annual sum against contingencies, were they to be penalized, when the consequences of being provident would redound to the benefit of the consumer? The amount of the contributions was carefully regulated by the capital, which, he might point out, was again related to consumption.

With regard to interest on loan capital, the Board were asked to take cognizance of the fact that in the interval between 1914 and the present time the Comptany had had to pay for their loans, and to have regard to the difference in the cost of money between then and now. After all, money was just as necessary as pipes or coal to the production of gas. Rather than go into the market and issue capital, they had found it was better, in the interests of the undertaking, to borrow it. The increased cost of money was beyond the Company's control, and was an increased cost " of and incidental to the production of gas." He appreciated the suggestion that borrowed money ought to reflect itself in increased revenue, if the borrowed money had all fructified. It was clear that the capital had not fructified to the full extent, and they could not hope to reap the full return for a considerable time.

Referring to Mr. Valon's method of estimating the net cost of coal, he demurred from this altogether. Mr. Valon had arrived at a figure below the actual price paid for coal. The Board of Trade were entitled to take the actual price. Mr. Evetts had taken the view that the Company should look forward a little when considering a revised standard price. Mr. Valon had suggested that they could ask the Board of Trade to revise their price again if there was an increase in the price of coal at the expiration of the present inquiry. This course, however, would be most disastrous to the Company, who wanted to maintain their position in the market; and he asked the Board to take a long view, and to fix a standard price at a point where it was likely to remain for some time. With regard to coke, the Board of Trade must take the circumstances of the Company as they existed, and assume good management until the contrary was proved.

Upon the whole matter, Mr. MacMillan submitted that the Company had proved their figure. The Board of Trade were entitled to take into account all he had adduced, and, having done so, the reduction of 2·2d. from the standard price fixed in 1921 adequately represented the actual reduction in costs due to circumstances beyond the Company's control. This gave the Company no compensation at all for the increased business brought about by their enterprise. As to the point made that the Company had maintained their full permissible dividends on their sliding-scale stock, on the assumption that, if it were reduced, the dividend on the maximum stock would also have to be reduced *pro rata*, he said that in fact they were legally advised to do so. The Company did not ask the Board of Trade to restore the pre-war dividend.

Mr. KEEN, on behalf of the applicants, submitted that the basis adopted by Mr. Valon in arriving at the cost of production and supply of gas was the proper one. Perhaps the most striking thing about Mr. Evetts' figure for the present net cost of coal—namely, 18·23d. per 1000 c.ft.—was that it was nearly 7½d. per 1000 c.ft. in excess of the 1924 figure, though admittedly in 1924 coal was commanding a bigger price than at present. With regard to interest on loan capital, he said it was agreed that, in arriving at the standard price, there should be an allowance for increased interest on floating loan capital; but there was no ground for bringing in such a charge in respect of fixed loan capital. In the first place, Mr. Evetts did not know how much capital was borrowed for the purposes of the gas undertaking. It was said that on the whole undertakings of the Company 55 p.ct. of the money had been raised by capital stock, and 45 p.ct. by borrowing; and therefore it was said that the capital expended on the gas undertaking had been raised in that proportion. It was merely a calculation. But apart from this, no company would raise money for permanent capital expenses unless it intended that the money should return an appropriate revenue, in order to return an appropriate interest or dividend. Therefore, there was no reason for distinguishing between fixed loan capital and fixed capital raised by the issue of stocks; the interest and the dividend were both rewards to those who provided the money.

Mr. RONCA said that, in the early years, if loan capital were expended on mains, those mains might not give a return, but the interest on the loan had still to be paid.

Mr. KEEN said that might be so, but a company did not necessarily expect the mains to be remunerative immediately; they expected them to be remunerative later, and that was what made it worth while to spend the money.

In reply to a further question by Mr. Ronca, he said he was not asking the Board to fix a standard price so as to provide a dividend on the stock and nothing for the payment of interest on loans. He was asking the Board to fix a standard price which would provide a uniform fund for the payment of both interest on loans and dividend on capital, so that the two would be lumped together. On the other hand, the Company were asking that there should be a fixed charge on the revenue produced, adequate to pay a higher rate of interest on a portion of the loan capital. As to the contribution to the special purposes fund, he urged that this could not be considered as a cost when arriving at the revised standard price, under the terms of section 1 of the Gas Regulation Act. The contribution did not come into the category of " costs and charges " at all. In the case of this particular Company this must be abundantly evident, because the special purposes fund was applicable to meet exceptional expenditure not only in relation to the gas undertaking, but also in relation to the water and electricity undertakings. How could it be said that a sum set aside for the payment of unusual expenses on the water and electricity undertakings was a charge " of and incidental to the production and supply of gas? "

Mr. RONCA: What is the position if it applies to the gas undertaking only?

Mr. KEEN: It is still not within the category of costs and charges.

Mr. RONCA pointed out that, if a catastrophe happened, and there were no fund, the Company would have to find the money to face it.

Mr. KEEN remarked that then there would be a cost or charge falling on the year in which the catastrophe happened, but if a contribution were made to the fund in any year, it was not a cost or charge in that particular year. It was in the nature of a reserve, which could be set aside or not, at the Company's option.

As to the question of onus, he did not think the Board need trouble very much. If the onus were upon the applicants to establish that there had been alterations in the costs brought about by matters outside the control of the Company, there must equally be an onus on the Company, if they were to obtain allowances, to establish that those allowances were in respect of matters within their control. With regard to the diminishing differential in the outside districts, this was a complaint against the Legislature. Parliament had made this definite legislation with regard to differentials, and the right party to make an alteration was Parliament. The effect of the war upon this Company was the same as upon other companies situated in military areas. The 1924 figures showed that the capital expenditure per million c.ft. of gas sold was beginning to decrease, so that they were beginning to recover, and to use the equipment which had not been used since the war. He submitted that the Company were in an advantageous position, because they had a large equipment and a growing business, and there was every probability that they would derive the fruits from the capital expended.

Finally, Mr. Keen pointed to the small amount of capital of the Company which was subject to the sliding-scale, so that the consumers were less protected than in a case where the whole of the capital was subject to the sliding-scale. This was a substantial ground on which the local authorities asked the Board of Trade to be particularly careful to rivet the Company down to what should not be more than a fair standard price.

The inquiry then closed.

ROYAL COAL COMMISSION.

The Views of Mr. Merz.

On Thursday, Nov. 27, Mr. C. H. Merz, the prominent electricity supply expert, who has been associated with the electrical development on the Tyneside, and among other works is now connected with the County of London Electric Supply Company's Barking power station, gave evidence before the Coal Commission. After stating that he did not believe that the continued development of electricity supply would detrimentally affect the coal industry, Mr. Merz said that one method for improving the efficiency with which coal was used was by turning it into gas which, for many purposes, was a particularly suitable and economical heating medium. The remarks which he had made with regard to the effect of the development of electricity supply upon the coal industry applied, he said, equally to the development of the use of gas. Another method of improving the efficiency with which coal was used, and consequently the output and profits of the coal industry, was the carbonization of coal. The view was expressed that carbonization, and the extraction of the bye-products before the coal was used for the production of electrical energy, could usefully be applied; but this, of course, was partly an economic question depending upon the cost of coal and the value of the bye-products. A definite scheme of making the country cleaner, and getting rid of smoke by proper development of the way in which coal was used, by increased production either of gas or of electricity, was, said Mr. Merz, one upon which it should be possible to agree; and any such development would do a great deal to improve trade.

In the course of his answers, Mr. Merz said he had studied closely the problems of carbonization in relation to the generation of electricity, and contended that there would be no difficulty in arriving at a commercial process if it were conducted on a large enough scale.

Speaking of the proposed Government scheme for dealing with the electricity supply industry, Mr. Merz said the delay in making known the details of these proposals was having an adverse effect in many directions, because it was holding-up several important schemes which otherwise would have been proceeded with ere this.

Apart altogether from the economic position, as affected by carbonization, Mr. Merz said there was the question of national policy from several points of view; and he expressed the opinion that the advantages of reduction of smoke, improved health and cleanliness, increased manufacturing possibilities, and so on, were so great that it would pay well to tax imported oils and give a rebate on such taxation, at any rate for several years, to oils and petrol produced at home. This could be done without in any way interfering adversely with the trade of the country, for the taxes which were at present collected from motor users, and devoted to road improvement, could as easily be collected in this way either partly or entirely, and the present tax on the horse-power of a motor-car either cancelled or considerably reduced.

Other methods of improving coal products and their value to the community were cleaning the coal, briquetting, and pulverizing. Mr. Merz added that he could speak as to what had not been done in this country in this direction, and as to what had been done abroad, especially in America, in the way of pulverizing the coal. If there was any question of the Government doing anything to assist the coal industry, either by taxation of imported oil or by altering the laws affecting the generation and supply of electrical energy, the necessity of coming to a definite and rapid decision was of much more importance than what that decision might be, if the criterion was not an ideal organization, but the trade of the country.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The position remains somewhat irregular, owing in part to the bad weather and its effect on shipping, and in part to a falling-off in the demand. The latter applies principally to the Northumberland steam coal section, and prices are below the recent best for prompt shipment, though collieries are maintaining quotations for forward positions.

On the other hand, the demand for Durhams has shown some improvement as against the previous week, and gas coals, especially seconds, closed the period with considerable strength, the inquiry both for prompt and forward shipment being good. Wear Specials have raised the quotation to 16s. 6d. to 17s. f.o.b., and best qualities quote 16s. 3d. to 16s. 6d. Seconds are 15s. to 15s. 3d.

Unscreened coking makes are quiet for early shipment; but forward inquiry remains good, and they are called 14s. 9d. to 15s. 6d., according to quality. Best Durham bunkers are 14s. 9d. to 15s. 6d.

The demand for coke remains strong, and stocks are in all cases cleared. Gas makes ask 24s. 6d. to 25s. 6d., and business is restricted by lack of supplies.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The wintry weather has brought about an increased demand for all descriptions of household coal, and the stocks which collieries had some weeks ago have now disappeared. The real winter trade has, however, not yet begun.

There appears to be some improvement in the demand for industrial fuel, especially the better grades of washed coal, which are commanding rather better prices; while there are many inquiries in the market for renewal of contract business to commence next year. Prices generally have an upward tendency.

Gas coal is moving more freely, and there is very little surplus for other than contract requirements.

The export market continues quiet, and values are hardly as firm as they were a week ago.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 18s. 3d. to 18s. 4½d.; screened gas coal, 17s. 6d. to 18s.; washed trebles, 19s. 6d. to 20s.; washed doubles, 18s. 9d. to 19s. 6d.; washed singles, 17s. 9d. to 18s. 3d.; washed smalls, 13s. to 13s. 3d.; rough slack, 9s.; smithy peas, 19s. 6d. to 20s. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 16s. to 17s.; screened gas coal, 16s. 6d.; washed doubles, 17s. 3d. to 17s. 6d.; washed singles, 16s. 6d.; washed smalls, 12s. 6d.; unwashed doubles, 13s. 6d. to 14s.; coking smalls, 9s. per ton. Derbyshire and Nottinghamshire—Top hards, 18s. 9d. to 20s.; washed doubles, 18s. to 18s. 6d.; washed smalls, 12s. 6d. to 13s. 3d.; unwashed doubles, 14s. to 15s.; rough slack, 9s. to 9s. 3d. per ton. Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, 15s. 3d. to 17s. 3d.; gas coke, 23s. 6d. to 26s. 6d.; furnace coke, 18s. 6d. to 19s. 6d. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The most significant feature in the Midlands is that though November brought unusually severe weather, with occasional fogs which dislocated traffic at the same time as they increased the call on the fuel supply, there has been a lack of tension except of the most local character. With the quickened consumption at electricity undertakings slacks and smalls have ceased to be a drag on the market.

There has been a large demand for household fuel, and this has had a steadying effect in directions where there had been instability. It is no longer possible to get special quotations from collieries.

Gas coal is being consumed on a large scale; but contractors have no real difficulty in adjusting themselves to these exigencies. If there is any delay, it arises from disordered transport. Stocks are still so heavy that the position is free from anxiety. The pits are working regularly in most cases; but there have been occasional interruptions through lack of wagons to distribute the output.

THE COCK TAVERN LEGEND.

Changes that have recently taken place in the kitchen equipment of the famous Cock Tavern in Fleet Street are a reminder of the legendary origin of the Cock and the Plump Head Waiter, immortalized by Tennyson in "Will Waterproof's Lyrical Monologue." The old cooking system has been replaced by a complete equipment of Richmond gas cooking appliances, including a roasting oven, a griller, vegetable and pudding steamers, and a gas-heated carving table.

"Ye Olde Cock Chop House" was founded in 1549, which may have been the beginning of that period of "hellish smoak" pollution in London against which John Evelyn, the diarist, inveighed so vigorously. Smoke guided the destiny of the lordly cock, as, bearing the "pottle-bodied boy" in his claws, he came crowing over Thames:

> "Right down by smoky Paul's they bore,
> Till, where the street grows straiter,
> One fix'd for ever at the door,
> And one became head waiter."

Perhaps, had the cock come flying over Thames at a later period, when modern gas fires and gas cookers had thinned-out the smoking chimneys, he would have caught a glimpse of the green fields beyond, and established himself and the Plump Head Waiter in some country hostelry, where they would have missed for ever the mighty literary associations of "The Cock" of Fleet Street.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 30.

The improvement in the market for pitch reported last week has been maintained, and the price is steady at 47s. 6d. per ton in bulk, f.o.b.

Creosote is steady and unaltered at 7⅛d. to 7¼d. per gallon.

There is a fair amount of inquiry for pyridine, and makers' idea of price is not below 20s. per gallon filled into buyers' drums.

Tar spirits are in demand at the prices last recorded.

Tar Products in the Provinces.

Nov. 30.

The market for pitch has been firm throughout the past week, and there has been an advance in the price; but the purchases would appear to have been mainly on the part of dealers, as the Continental consumers do not yet seem to have paid full advance.

Creosote remains steady with a fair demand for home and export.

Water-white products are quietly firm.

There is, of course, not quite so much demand for benzole; but this is only the customary slackness of the time of year.

Solvent naphtha is in fair demand; and the rubber manufacturers appear to be considering purchases for the first half of next year.

Cresylic acid is still very firm, and special grades are fetching good prices.

The average values for gas-works products during last week were: Gas-works coal-tar, 34s. to 39s. Pitch, East Coast, 47s. 6d. to 50s. f.o.b. West Coast—Manchester, 42s. 6d. to 45s.; Liverpool, 43s. 6d. to 46s.; Clyde, 48s. to 49s. Benzole, 90 p.ct. North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North 7½d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6½d. to 6⅝d.; salty, 6d. to 6¼d.; Scotland, 5⅝d. to 6d. Heavy oils, in bulk, North, 6½d. to 6⅝d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

CONTRACTS OPEN.

Retorts and Firebricks.

The County Borough of Salford are inviting tenders for the supply of retorts, firebricks, &c. [See advert. on p. 609.]

Welded Steel Mains.

The Gas Committee of the Manchester Corporation are inviting tenders for the supply of 36-in. welded steel pipes. [See advert. on p. 609.]

Pipes, Meters, and General Stores.

The Corporation of Stockton-on-Tees are inviting tenders for six months' supply of meters, pipes, and numerous stores. [See advert. on p. 609.]

EXTENSIONS.

Chesterfield Gasholder.

The Chesterfield Corporation are considering a scheme for the erection of a new gasholder.

Limerick Gas Scheme.

The Limerick Corporation have now obtained the sanction of the Free State Local Government Department for the borrowing of £30,000 for the purpose of carrying out improvements in the gas-works.

Naphthalene Washer for Lancaster.

The Lancaster Corporation Gas Committee have received sanction to borrow £54,100 for their works extensions. They are asking for tenders for a naphthalene washer. A new main is being laid through the town.

Inquiry at Bangor.

At a Home Office inquiry into an application by the Bangor (Co. Down) Council for sanction to loans of £2000 for purifiers and £4000 for mains, Mr. Milliken, the Town Clerk, said the manufacture of gas had been more than trebled since 1914. The consumption of gas, which in 1919 was 64,484,000 c.ft. and in 1920 82 million c.ft., had increased to 170 millions in the past year.

Carbonizing Plant and Scrubber for Colwyn Bay.

Recently, Mr. J. Smith, Engineer to the Colwyn Bay gas undertaking, submitted to the Lighting Committee the report of a scheme of extensions to the gas-works at an estimated cost of £32,702, which sum includes £30,702 for a 1-million c.ft. per day carbonizing plant, built to allow of duplication when necessary, and £2000 for a 1-million c.ft. per diem tower scrubber, with connections prepared for duplication. He has been instructed to invite competitive schemes to standard specification for the provision and erection of the new plant.

At St. Lawrence School, York, last week, the Lady Mayoress presented prizes to the winners in a recent schoolgirl cooking competition instituted by the York Gas Company. The Rev. E. C. Hudson, M.A., Vicar, presided, and was supported by Mr. H. E. Bloor (Engineer and General Manager to the Gas Company), who explained that the competition arose out of a desire on the part of the Directors of the Company to help in cookery tuition by extending the knowledge of gas cooking. This was the ninth competition of the kind instituted by the Company, and open to the schools of York.

STOCK MARKET REPORT.

THE political crisis in France was an influential factor on the Exchange last week. The franc fell again to a new record; and while there was some improvement at the end of the week, there is little prospect of any material recovery until the country's finance is put in order. In this respect the Belgian Parliament have given their friends and neighbours a good lead, and have decided to accept the advice of the American bankers to modify their Budget.

In spite of some frenzied dealings in Rubbers, business generally was quieter last week. British Government stocks were a little firmer.

The prices of Gas Stocks were steady, and the improvements which have been taking place during the past month were less noticeable. The Liverpool 5 p.ct. ordinary dropped 1¼, to 83—84, on the Local Exchange, and there were several reductions in Foreign companies' shares; but Tottenham "A" and "B" stocks were marked up 2 and 1 points respectively. It is rumoured that this Company are very dissatisfied with their standard price, and that an application for revision may be expected shortly. It is general knowledge that section 1 of the Gas Regulation Act, as interpreted and administered by the Board of Trade, has failed to give the relief to the companies that was the intention of Parliament, and action with the object of remedying the defect may, if our information is correct, be expected shortly.

The following transactions were recorded during the week:

On Monday, Bombay 19s., European 6¼, Gas Light and Coke 86½, 87, 87⅛, 3½ p.ct. maximum 60¼, 4 p.ct. preference 79, 79½, 3 p.ct. debenture 60½, 61, 61¼, Imperial Continental 138, 139, 139½, 140, 141, 141½, *ex* div., Primitiva 12s. 6d., 12s. 7¾d., 12s. 9d., 12s. 10¼d., South Metropolitan 93¼, 93⅜, 94, 6½ p.ct. debenture 103½, 104, Tottenham "B" 90, 90½. Supplementary prices, Metropolitan Gas (of Melbourne) 8⅛, 8 21/32.

On Tuesday, Bombay 18s. 3d., 19s. 3d., Brighton and Hove 172½, "A" 139, British 106, 106¾, Croydon sliding-scale 97½, maximum dividend 82, European 6½, 6⅝, Gas Light and Coke 86⅞, 87, 87⅛, 87⅜, 87½, 87⅝, 88, 3½ p.ct. maximum 60, 4 p.ct. preference 79¾, Imperial Continental 139, 140, 141 *ex* div., Montevideo 69, 70 *ex* div., Primitiva 12s 4½d., 12s. 6d., 12s. 10½d., 4 p.ct. debentures 85, South Metropolitan 94½, South Suburban 99½, 5 p.ct. debenture 96, 97, Tottenham "B" 91. Supplementary prices, Bournemouth new 7 p.ct. "B" 12⅜, Brighton and Hove 4 p.ct. debenture 76.

On Wednesday, Bombay 18s. 6d., 18s. 9d., Brentford "B" 102, Brighton and Hove 172, Commercial 3½ p.ct. 81, 82, 3 p.ct. debenture 60½, Croydon maximum dividend 83, Gas Light and Coke 87, 87¼, 87⅜, 88, 4 p.ct. preference 79, 79½, 3 p.ct. debenture 60½, Imperial Continental 139, 140 *ex* div., Liverpool 7 p.ct. preference 102½, Oriental 104½, 105, Primitiva 12s. 4½d., 12s. 6d., 12s. 9d., South Metropolitan 94, Tottenham "B" 90, Uxbridge, Maidenhead, and Wycombe 5 p.ct. 94⅜, 95, Wandsworth "B" 111⅜, 111½, Epsom 5 p.ct. 113¾, 114, 3 p.ct. debenture 58⅜. Supplementary prices, Brighton and Hove 7 p.ct. new debenture 105, 105½, Horley 10 p.ct. "A" 134, 135, Kingston-upon-Thames 104½, 105, Leatherhead 5 p.ct. ordinary 9⅝, 9¾, Redhill 5 p.ct. "B" 81, Sutton 107½.

On Thursday, Alliance and Dublin 69⅜, Brighton and Hove 173, Commercial 4 p.ct. 82, Continental Union 38, 38⅛, 7 p.ct. preference 90, Croydon sliding-scale 98½, European 6½, Gas Light and Coke 86⅞, 87, 87⅛, 87⅜, 4 p.ct. preference 80, Imperial Continental 139, 140, 140½ *ex* div., Primitiva 12s. 7½d, South Metropolitan 93½, 93¾, 95, Tottenham "B" 91. Supplementary prices, Gas Light and Coke 10 p.ct. Bonds 196, Southend-on-Sea 5 p.ct. new 86.

On Friday, Alliance and Dublin 69½, Gas Light and Coke 87½, Imperial Continental 139½ *ex* div., Primitiva 12s. 3d., 12s. 4½d., 12s. 9d., South Metropolitan 93⅜, 94, 94¼, 94½, 95, South Suburban 5 p.ct. 99½, Tottenham "A" 112. Supplementary prices, Bournemouth new "B" 12⅜, Cape Town 5 p.ct. mort. debentures 75, Colonial 5 p.ct. debentures 71½.

The position of the Bank's reserve had an important influence on discount rates, which stiffened generally. Loanable funds, however, were in plentiful demand, and overnight money was obtainable in some instances at as low as 2 p.ct. With the distribution of dividends on the 1st inst., rates are not expected to rise. Treasury Bills were allotted at £3 19s. 0·91d. p.ct.

The fluctuations of the French franc dominated the Foreign Exchange Market. The highest point touched was 130, and the price closed at 124.68¾. Insurances have been effected at Lloyd's against a retrogression to various levels, the highest of which was 175. Belgian francs closed at 106.95, and Italian lire at 120.

Silver was dull on Chinese selling, and the price closed at 31 1/16d. per oz. Gold remained unaltered at 84s. 11½d. per oz.

The Bank Rate is 4 p.ct., to which it was reduced from 4½ p.ct. on Oct. 1. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 27.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	..
295,402	"	"	4	4	Do. 4 p.c. Pref.	70—75	..	..
1,551,868	"	Oct. 8	6½	6½	Alliance & Dublin Ord.	68—72	..	69 17/32—69⅞
374,000	"	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	¾—1	..	18/3—19/3
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	"	7	7	Do. B 7 p.c..	12—12½	..	..
150,000	10	"	6	6	Do. Pref. 6 p.c..	11—12	..	..
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb..	56—59	..	..
162,025	"	"	4	4	Do. 4 p.c. Deb..	77—80	..	..
992,045	"	July 9	6 5/10	6 5/10	Brentford A Con.	100—105	..	..
990,500	"	"	6½	6½	Do. B New	100—105	..	102
76,000	"	"	5	5	Do. 5 p.c. Pref.	95—98	..	..
306,690	"	June 11	4	4	Do. 4 p.c. Deb.	76—81	..	..
181,337	"	"	6	6	Do. 6 p.c. Rich Red. Deb.	100—105	..	..
214,740	"	Aug. 27	12½	12	Brighton & Hove Orig.	170—175	..	172—173
444,200	"	"	9½	9	Do. A Ord.	135—140	..	139
1,287,500	"	July 23	5	5	Bristol 5 p.c. max..	89—91a	..	..
855,000	"	Oct. 8	7	8	British Ord.	105—110	..	106—106¾
100,000	"	June 25	7	7	Do. 7 p.c. Pref..	130—135	..	..
120,000	"	"	4	4	Do. 4 p.c. Red. Deb.	71—76	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref..	6½—7½	−½	..
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb..	70—75	..	..
626,860	"	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	"	June 25	7½	7½	Do. 7½ p.c. Red. Deb..	101—104	..	..
157,150	"	Aug. 13	6¾	5	Chester 5 p.c. Ord.	90—95b	..	..
1,513,280	"	July 23	5/14/8	5½	Commercial 4 p.c. Cap.	81—86	..	82
560,000	"	"	5¾	5/3/4	Do. 3½ p.c. Cap.	81—86	..	81—82
475,000	"	June 11	3	3	Do. 3 p.c. Deb.	56—59	..	60¾
800,000	"	Oct. 8	—	4	Continental Union, Ltd.	37—40	−1	38—38½
200,000	"	"	7	7	Do. 7 p.c. Pref.	87—90	..	90
660,000	"	Aug. 13	6½	6½	Croydon sliding scale	97—101	..	97½—98½
284,975	"	"	5	5	Do. max. div.	81—84	..	82—83
492,270	"	Aug. 13	9	6	Derby Con.	107—109c	..	..
55,000	"	June 25	4	4	Do. Deb.	74—76c	..	..
1,002,180	10	July 23	4	6	European, Ltd.	6½—7½	−¼	6¼—6⅜
16,460,070	Stk.	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	86—88	..	86¼—88
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	60—63	..	60—60½
4,062,235	"	"	4	4	Do. 4 p.c. Con. Pref.	77—80	..	70—80
6,761,950	"	June 11	3	3	Do. 3 p.c. Con. Deb.	60—63	..	60½—61½
150,000	"	—	10	10	Do. 10 p.c. Bonds	..	..	196
42,000	"	"	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	"	Sept. 10	6½	6½	Hastings & St. L. 5 p.c. Conv.	90—95	..	..
258,740	"	"	5½	5½	Do. 3½ p.c. Conv.	71—76	..	..
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19½—20½	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	"	Nov. 19	39	10	Imperial Continental Cap.	137—142*	..	138—141½
226,170	"	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	"	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord..	97—102	..	..
2,127,340	"	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	83—84b	−1½	..
600,000	"	Sept. 24	7	7	Do. 7 p.c. Red. Pref.	101¼—103½b	..	102½
165,736	"	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	"	June 25	3	3	Do. 3 p.c. Deb.	55—60	..	..
75,000	5	June 25	3	7	Malta & Mediterranean	4—4½	..	..
341,920	Stk.	Nov. 19	4	4	Montevideo, Ltd.	66—70*	..	69—70
2,061,315	"	Aug. 13	5	5	Newcastle & Gateshead Con.	71—71½d	−½	..
300,929	"	"	4	4	Do. 4 p.c. Pref..	75½—76½d	..	..
529,705	"	June 21	3½	3½	Do. 3½ p.c. Deb.	68—69d	..	..
15,000	"	Aug. 27	12	11½	North Middlesex 10 p.c.	160—170	..	..
75,940	"	"	8⅝	8 5/16	Do. 7 p.c.	115—120	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	102—107	..	104½—105
188,120	"	June 25	7¼	7½	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	"	13	13	Do. C	90—93	..	..
2,289,909	1	—	—	—	Primitiva Ord.	12/3—13/3	..	12/3—12/10½
302,600	100	June 2	4	4	Do. 4 p.c. Red. Deb..	84—86	..	85
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	64—66	..	..
193,744	"	June 25	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	..
264,496	"	"	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	..
150,000	10	Sept. 24	6	6	San Paulo 6 p.c. Pref.	7½—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—45	..	..
270,000	Stk.	Aug. 27	5½	5½	Sheffield A	99—101a	..	..
419,968	"	"	5½	5½	Do. B	99—100a	..	..
1,047,000	"	"	5½	5½	Do. C	99—100a	..	..
90,000	10	June 11	6	4	South African	6—8	−1	..
6,609,895	Stk.	Aug. 13	6½	5	South Met. Ord.	93—95	..	93½—95
1,893,445	"	July 9	3	3	Do. 3 p.c. Deb..	57—60	..	..
734,000	"	Sept. 10	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	103½—104
91,500	"	Aug. 13	8½	8½	South Shields Con.	130—132d	..	..
1,187,795	"	July 23	6½	6½	South Suburban Ord. 5 p.c.	99—103	..	99½
368,837	"	June 25	5	5	Do. 5 p.c. Deb.	95—98	..	96—97
647,740	"	Oct. 22	5	5	South'mpt'n Ord. 5 p.c. max.	78—81	..	..
121,275	"	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	"	Aug. 27	7	7	Swansea 7 p.c. Red. Pref..	100—102	..	..
200,000	"	June 25	6½	6½	Do. 6½ p.c. Red. Deb..	101—103	..	..
120,000	"	July 23	8	7½	Tottenham District A 5 p.c.	110—115	+2	112
882,275	"	"	6½	3½	Do. B 3½ p.c.	88—93	+1	90—91
150,000	"	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	—	..
181,255	"	June 11	4	4	Do. 4 p.c. Deb.	76—79	..	..
258,251	"	Aug. 27	5	5	Tynemouth Con. and New	70—72d	..	..
197,294	"	Aug. 27	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c..	93—98	..	94½—95
88,350	"	"	5	5	Do. 5 p.c. pref.	93—98	..	..
91,800	"	"	6½	6½	Do. 5 p.c. Maidenh'd	88—93	..	..
					Wandsworth, Wimbledon, and Epsom—			
50,000	"	July 9	9½	8½	Wandsworth A 5 p.c.	128—133	..	..
235,636	"	"	7½	7	Do. B 3½ p.c. t.	109—114	..	111½—111½
392,955	"	"	6/9/6	5/19/0	Do. C and New	92—97	..	..
352,000	"	"	7⅜	6½	Wimbledon 5 p.ct.	103—108	..	..
98,000	"	"	7⅛	7½	Epsom 5 p.ct..	113—118	..	113½—114
88,416	"	June 25	5	5	3 p.c. Deb.	56—59	..	58½

Quotations at :—*a*,—Bristol, *b*,—Liverpool. *c*,—Nottingham. *d*,—Newcastle. *s*.—Sheffield. *Ex, div.

Lincoln Gas Exhibition.

During the two weeks, Nov. 16 to 28, an attractive exhibition was held at the St. Hugh Hall, Lincoln; the Lady Mayoress, Miss M. E. Melvile, officiating at the opening ceremony. Visitors were able to inspect the latest productions in domestic gas cooking appliances, and also gas grates, water heaters, radiators, &c., supplied by the following firms: The Davis Gas Stove Company, Ltd., "Alpine" cookers, "Cæsar" and "Brutus" gas grates, "Clover" geysers, &c. Messrs. Fletcher, Russell, & Co., Ltd., "Aldwich" cookers, "Historic" series of gas grates, water heaters, radiators, and laboratory apparatus. The Richmond Gas Stove and Meter Company, Ltd., "Bungalow" cookers, "Period" series of gas grates, "Marlborough" fires (the latter in the new "lustre" as well as black finishes), and water heaters, which were well represented by the "Hollar" circulating boiler, "Don" geyser, and "Lyn" sink boiler. Messrs. Wilsons & Mathiesons, Ltd., "Royal" cookers and "Sunbeam" and "Sola" fires. Messrs. John Wright & Co., "New Eureka" cookers, with the labour-saving patent single hotplate bar, "Classic" series of gas grates in black and special colour finishes, radiators, &c. The exhibition was an undoubted success; and great credit is due to the organizers and exhibitors. It should do much to further arouse the interest of the general public in gas and gas-consuming appliances.

Deal and Walmer Gas Company.—The issue of £12,000 new ordinary stock of the Company, advertised recently in the "JOURNAL," was considerably over-subscribed.

Record Day's Output at Manchester.—On Friday, Nov. 27, 31,692,000 c.ft. of gas were supplied by the Manchester Gas Department, compared with the previous record of 29,997,000 c.ft. on a day in 1923.

Marking the Leek Centenary.—In order to mark the centenary of the Leek Gas-Works, the Urban Council have decided to allow an additional discount of 3d. per 1000 c.ft. to all consumers during the quarter ending March, 1926, subject to prompt payment.

Cheaper Industrial Gas at Chesterfield.—The Chesterfield Gas Committee have reduced the price of gas for industrial purposes. Small consumers are to be charged at the rate of 6d. per therm; and those taking 4½ million c.ft. or more a quarter, 5d. per therm—both less a discount of 12½ p.ct.

Change of Address.—Messrs. Cash, Stone, & Co. (formerly of 90, Cannon Street), have removed to 46, Copthall Avenue, London Wall, E.C. 2. The firm's new telephone number will be: London Wall 4481; and their telegraphic address: Cashbook, Stock, London. This change also applies to the following Gas Companies: Herne Bay Gas Company, Ltd., Bournemouth Gas and Water Company, Houghton-le-Spring District Gas Company, South African Lighting Association, Ltd., and Barbados Gas Company, Ltd.

Colonial Gas Association, Ltd.—The report of the Directors for the year ended June 30 showed that the amount of credit at the net revenue account was £33,058. Dividends were recommended of 8 p.ct. per annum (less interim dividend of 4 p.ct. for the half-year ended Dec. 31, 1924) on the preference shares, and 9 p.ct. per annum (less interim dividend of 4½ p.ct.) on the ordinary shares. It was also recommended that £4000 be added to the reserve fund, that £4000 be set aside for Australian income-tax, and that £11,623 be carried forward to the next account.

Montgomery Gas Supply.—At the last monthly meeting of the Montgomery Town Council, the question of the gas supply took another awkward turn. The lessee of the gas-works (Mr. Wilkes), who supplies the gas under contract, interviewed the Council, and said that owing to the expense of running the gas-works during the last two or three months, he was practically compelled to sell his gas plant. Alderman C. P. Davies said it was very unsatisfactory at the present time; and he did not know what would happen if Mr. Wilkes sold the plant. What he wished to know was how he was going to make gas without plant. In view of past experiences, he (Alderman Davies) should not advise the Council to buy anything connected with the works. Mr. Proctor called the attention of Mr. Wilkes to the fact that he was under a contract with the Council to supply the borough with gas; and if he was going to sell the plant, he could not fulfil his obligations. It was decided to further discuss the question at a special meeting of the Council.

Electricity at Whitchurch.

An unusual situation was brought about by the Whitchurch Urban Council at a special meeting over the question of distributing electricity. Nearly twelve months ago the Council decided to support the application of the Whitchurch Gas Company for distributing powers. The Gwynnydd Trust subsequently decided to go on with their application in spite of this decision, and the Council resolved to oppose the application of the Trust. At the last meeting of the Council, however, dissatisfaction was expressed with the long delay of the Gas Company in preparing and submitting their Order to be applied for. The copy of the Order having been at last submitted, it was said to vary materially from the original draft. The streets to be supplied were different, and Malpas was included in the application. The Clerk was requested to go into the whole matter, and advise the Council at the special meeting. He then advised them that the proposal to take in the rural districts of Whitchurch and Malpas would make the scheme a vastly more costly one, and the capital expenditure necessary rendered the scheme prohibitive. Moreover, the Gas Company were at present paying a dividend of 10 p.ct., and the new capital raised would be entitled to 7 p.ct. But if those maximum dividends were not earned, the present shareholders would have their 10 p.ct. reduced proportionately with the 7 p.ct. shareholders. This being so, it followed naturally that the price of gas in Whitchurch would be raised, in order that the present dividends might be earned. In view of this statement, several members of the Council thought their support ought to be withdrawn; and a resolution to this effect was carried. It was decided to state the grounds of objection to both applications to the Electricity Commissioners.

The Armagh Gas Light Company have reduced the price of gas by 5d. per 1000 c.ft.; the new rate being 6s. 3d.

Recent contributors to the Leeds University Extension Appeal Fund include the Yorkshire Junior Gas Association, 20 guineas; and Messrs. Wilsons and Mathiesons, Ltd., £500.

Messrs. Pope & Smith, at Ledbury, last week, sold 24 fully-paid shares in the Ledbury Gas, Coal, and Coke Company. Two lots went for £16 10s. each, one at £16 5s., and the fourth for £16.

At a meeting of the Newry Urban Council, the Clerk (Mr. W. Cronin) reported that the public gas lighting of the town under the Council cost £1000 a year, and that it was so efficiently carried out that no more lamps were now required.

The Southern representative of the Chiswick Meter Works (James Dougall), Mr. L. Truscott, will be prevented from making any calls for the next four or five weeks owing to an accident which has caused him to be laid up with a fractured foot.

Owing to the large number of essays sent in, numbering nearly 11,000, the British Commercial Gas Association find it impossible to announce at present the results of their £1200 Gas Essay Competition. The names of the prize-winners will be published in the Press on March 1.

The recent fog in the East Lancashire district had the result of causing the Accrington and District Gas Board to work at their utmost capacity; the output being almost 25 p.ct. in excess of the usual amount, and an extra 433,000 c.ft. being registered to meet the additional needs during one day.

The Shipley Gas Committee have decided to make a charge of 2s. 6d. for the operation of cutting-off supplies of gas to customers because of default of payment of accounts. It had been found that some people would not pay for their gas until it was cut off, and then paid, with the result that the gas immediately had to be renewed. Legally no charge could be made for putting the supply on, so as this was a troublesome business, the charge would be made for cutting-off.

Mr. R. Watson, Gas Engineer to the Doncaster Corporation, lectured at the Doncaster "Y.M.C.A." last week on the smoke nuisance. After outlining the early history of the use of coal, he spoke of the enormous consumption of raw coal to-day, and its tremendous ill-effect on human health and property. He then went on to show what a big factor is the use of gas—especially in domestic service—in reducing the smoke evil, and gave figures of the great increase in gas consumption in this country since 1902, with consequent benefit to the community. A member of the audience, in the course of questions after the lecture, suggested that the day of gas was over, except from the point of view of obtaining bye-products from carbonization; but Mr. Watson answered that he was astounded to hear such a suggestion, in view of the fact that gas was unquestionably the premier heating agent, and its sale was increasing every year.

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